and

Toquepala Operations
Peru
Technical Report Summary

Report prepared for:
Southern Copper Corporation

Report prepared by:
Wood Group USA, Inc.

Report current as at: December 31, 2022

Date and Signature Page

This technical report summary (the Report), entitled "Toquepala Operations, Peru, Technical Report Summary" is current as at December 31, 2022. The Report was prepared by Wood Group USA, Inc. (Wood), acting as a Qualified Person Firm.

Dated: February 06, 2023.

"signed"

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wood.

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1.0 SUMMARY

1.1 Introduction

This technical report summary (the Report) was prepared for Southern Copper Corporation (Southern Copper) by qualified persons employed by Wood Group USA, Inc. (Wood, acting as the QP Firm) on the Toquepala Operations (the Project), located in the province of Tacna, Tacna Department, Peru.

1.2 Terms of Reference

The Report was prepared to be attached as an exhibit to support mineral property disclosure, including mineral resource and mineral reserve estimates, for the Toquepala Operations in Southern Copper's Form 10-K for the year ending December 31, 2022.

Mineral resources and mineral reserves are reported for the Toquepala deposit.

Unless otherwise indicated, all financial values are reported in United States (US) currency (US$) including all operating costs, capital costs, cash flows, taxes, revenues, expenses, and overhead distributions. Unless otherwise indicated, the metric system is used in this Report. Mineral resources and mineral reserves are reported using the definitions in Subpart 229.1300 – Disclosure by Registrants Engaged in Mining Operations in Regulation S–K 1300 (S-K 1300). The Report uses US English.

1.3 Property Setting

The Toquepala Operations are situated approximately 150 km by road from the city of Tacna. Road access from Tacna is via the Pan-American highway (Route 1S), TA-100, MO-107, TA-105, and TA-570. Alternative access is from Lima, using the Pan-American highway to Alto Camiara, and then driving for 70 km on a paved road to the Toquepala camp. The Quebrada Honda tailings storage facility (TSF) is 40 km south of the mine, and is accessed via the MO-107 route that connects Alto Camiara with Toquepala. Within the operations area, access is by unpaved mine and exploration roads. The city of Tacna has a regional airstrip, with regular service within Peru.

The climate is considered typical of desert conditions. Mining is conducted year-round.

1.4 Mineral Tenure, Surface Rights, Water Rights, Royalties and Agreements

The Toquepala Operations and the Ilo smelter/refinery are owned and operated by Southern Peru Copper Corporation, Sucursal del Perú.

The Project consists of 14 mining concessions totaling 24,280 ha.

Southern Copper also holds two beneficiation concessions. The beneficiation concessions have been amended on a number of occasions.

Southern Copper holds a "right of free use" on the uncultivated lands in the mining concessions and Quebrada Honda tailings TSF areas. There are granted easements covering the TSF and related facilities, the TSF pipelines, and water pipelines from the Suches lagoon to the Toquepala Operations. These easements will be maintained as current as long as the mine operates and Southern Copper pays the government annual fees.

Additional surface rights will be required to support WRSF capacity and TSF capacity in the LOM plan. There is a reasonable expectation these rights can be obtained in the timeframe envisaged.

Southern Copper has both groundwater and surface water usage licenses, for a total extraction rate of 1,950 L/s.

A mining royalty is payable to the Government of Peru, based on operating income margins with graduated rates ranging from 1–12% of operating profits, with a minimum royalty payment of 1% NSR on mine production. There is also a mining tax payable, based on operating income, with rates that range from 2–8.4%.

1.5 Geology and Mineralization

The Toquepala deposit is an example of a copper–molybdenum porphyry deposit.

The basal regional geology consists of Precambrian metamorphic rocks that are cut by Paleozoic granite, unconformably overlain by Upper Triassic to Jurassic marine volcanic and sedimentary lithologies. Overlying these rocks are late Cretaceous to early Tertiary rhyolite, andesite and agglomerate of the Toquepala Group. These lithologies are intruded by the composite, polyphase Cretaceous to Paleogene Coastal (Andean) Batholith.

Mineralization is closely associated with a complex, 1,500 m diameter intrusive center dominated by four phases of porphyritic dacite plugs, referred to as "T", "Main", "L/M" and "Late", a dacite diatreme and agglomerates, extensive hydrothermal breccias and latite porphyry stocks and dikes.

A zone of hydrothermal alteration of 5-6 km diameter has been recognized at Toquepala. The intensity of hydrothermal alteration varies from the center of the deposit towards the periphery, with four zones recognized, including a small quartz–biotite–K-feldspar ± sericite–chlorite–albite–anhydrite central (potassic) zone, a quartz–sericite–pyrite (phyllic) envelope at the periphery of the deposit, an extensive chlorite–epidote–calcite–pyrite (propylitized) zone, and a remnant argillic zone. The primary alteration type in the breccia zones is silicification, together with sericite and small amounts of clay minerals. On the breccia edges, propylitic alteration was more typical.

Mineralization consists of leached capping, oxide, enriched, transitional and primary mineralization. Leached capping, oxide, enriched and transition mineralization is mostly mined out. Primary mineralization occurs as hypogene sulfides mainly restricted to the dacite porphyry and breccias. Chalcopyrite is the dominant economic mineral with lesser bornite, molybdenite, and enargite as disseminations, fracture fillings, and breccia matrix. Economic molybdenite mineralization is associated with quartz veinlets and locally, with disseminated chalcopyrite.

1.6 History

Southern Copper has had an interest in the Project area since 1945. Prior to Southern Copper's Project interests, the area had been subject to artisanal mining activities.

Work conducted by Southern Copper and its predecessor companies included geology and photogeology studies, tunneling, churn drill, core and reverse circulation (RC) drill campaigns, metallurgical testwork, and engineering studies. The Toquepala mine and the Ilo smelter commenced operations in 1960.

1.7 Exploration, Drilling, and Sampling

Drilling totals 1,347 core and RC holes (486,548 m), collected using predominantly core with lesser RC methods. Drilling that supports mineral resource estimation consists of 1,037 core holes for 377,592 m. RC, geotechnical, and blasthole drilling are not used in mineral resource estimation support.

Historically, geological data were recorded on paper log forms; however, since mid-2018, logging data have been entered directly into a tablet PC through acQuire data entry. Logging currently uses pre-set geological codes. Logging consists of collection of structural and geological data, and recovery statistics. Core recoveries were reported by Southern Copper to be generally good.

Collar surveys for the 2001–2019 drill campaigns were taken by mine surveyors using differential GPS equipment (GNS8). The collar survey method for earlier campaigns is not known.

No data has been yet collected from the drilling executed in 2022. Assays are expected to be carried out in 2023.

Gyroscopic downhole surveys were completed for 25% of the holes in the mineral resource database. Approximately 27% of the holes >100 m deep were surveyed and only 5% of holes in the mineral resource database <100 m deep have downhole surveys.

Core samples were taken at 3 m intervals from the top of the drill hole.

The database contains 41,108 density determinations performed by Southern Copper personnel using the water immersion method.

Laboratories used for analysis have primarily been internal company laboratories, either at the Toquepala mine site or at the Ilo smelter (neither were accredited). Independent laboratories included Certimin, SGS, and Inspectorate, which had laboratory accreditations including ISO 9001, ISO 14001, and ISO 17025.

Sample preparation methods varied over time. Depending on the program this included: drying; initial crushing to 90% passing a -1/4 inch screen or crushing to passing 6 mm; secondary crushing to 90% passing -10 mesh; and pulverizing to 85% passing -200 mesh or pulverizing to 95% passing -140 mesh.

Analytical methods, where known, included atomic absorption (copper and molybdenum) and inductively coupled plasma (multi-element suite). Sequential copper analyses were also conducted, as were carbonate assays.

No systematic quality control procedure was used to provide quality assurance for assaying prior to 2016. There is a significant evolution in data acquisition and data quality control practices in the different drill campaigns in the Toquepala database. Comparison of data from the 2016-2019 program with earlier data from prior programs resulted in the conclusion that copper and molybdenum grades of adjacent intersections are comparable over tens of meters, and that analyses performed in the earlier drill campaigns show no evidence of being significantly biased. The current, since 2016, assay quality control program for the Toquepala site includes the insertion of field duplicate, pulp duplicate, certified reference materials (CRMs), coarse blank, fine blank and check samples. Blank analytical results do not show contamination for copper and molybdenum for drilling campaigns from 2016–2019. Southern Copper sent pulp samples from the 2017–2019 drill program to Certimin for check assays. Biases relative to the Ilo laboratory ranged from 1.2% to 4.9% for copper and from -5.0% to 1.0% for molybdenum, both of which are considered acceptable.

1.8 Data Verification

Wood's data verification included site visits, comparisons of the Toquepala dataset and its available original sources including collar, survey, density, assay certificates and reports, a limited check assay program, and reconciliation and other operational data. Wood's qualified person is of the opinion that the data verification programs for Project data adequately support the geological interpretations, the analytical and database quality, and therefore support the use of the data in mineral resource and mineral reserve estimation.

1.9 Metallurgical Testwork

Mining operations commenced in 1960, and the original samples supporting metallurgical testwork and process designs are long since mined out. Three different laboratories were used to perform metallurgical testwork to support the Project, of which one was an internal laboratory and two were external.

Testwork was conducted at the Laboratorio Metalurgico Chapi in Lima (Chapi) and internal Ilo laboratories, and consisted of comminution tests (Bond ball mill work index) and copper and molybdenum flotation testing.

Recoveries in the leach–solvent extraction (SX)–electrowinning (EW) (also referred to as LESDE) plant, used to leach low-grade sulfide mineralization, were initially based on results from a pilot plant that ran from 2003–2005. A large-scale test program was completed in 2006, which involved run-of-mine (ROM) dump leach testing of three modules for at least 400 days. The forecast average life-of-mine (LOM) recovery from the LESDE plant is 16.1% (excluding leach ore existing in leach dumps). The LOM leach copper recovery including leach ore existing in leach dumps is expected to be 8.0%.

Flotation recoveries are based on flotation testwork carried out in 2002. A regression analysis on the most significant variables (%Cu, %Mo, %Fe and %Cpy) was completed to provide a predictive recovery equation. The molybdenum recovery model was developed based on bench scale flotation testing carried out as part of the development plan in the period 2001–2002. Analysis of the testwork results indicated that the only significant variable affecting the molybdenum recovery was grade of the molybdenum in the plant feed. The LOM expected copper recovery is estimated at 88.2% and molybdenum recovery is estimated at 68.1%. The forecast LOM copper concentrate grade is 25.52% and the molybdenum concentrate grade is forecast at 55.80%.

Samples for metallurgical testing completed in 2006 and 2021 were selected based on a wide range of copper and molybdenum grades, and the mineralogical characteristics of the ore, expressed as ratio of main mineral types. This was used by Southern Copper to develop a model that covers the ore metallurgical variability.

The copper and molybdenum concentrates produced are considered clean concentrates as they do not contain significant amounts of any deleterious elements.

Wood's qualified person for metallurgy consider the metallurgical data adequate for the purposes of estimating mineral resources and mineral reserves and the economic analysis in this Report.

1.10 Mineral Resource Estimates

1.10.1 Estimation Methodology

Mineral resources were prepared by third-party consultants Hexagon, and reviewed, adjusted and endorsed by Wood qualified persons in accordance with definitions under S-K 1300.

Exploratory data analysis included a review of histograms, probability, scatter, and contact plots. Results indicated that zones of higher-grade copper and molybdenum mineralization are not obviously bound by lithological units; grade profiles across contacts and within lithological units are commonly gradational; there is poor correlation between the copper and molybdenum assays and copper and silver; and copper and molybdenum boundaries should generally be treated as hard during estimation.

The lithological model consists of 15 lithologies, of which the major units within the resource model were the dacite porphyry, diorite and angular breccia lithologies. The ore type model has four ore types, with a fifth coded for fill. Six alteration types, as well as fill material, comprise the alteration model. Copper estimation domains were based on lithology above and below the primary sulfides, whereas the molybdenum estimation domains were based on lithology only. Specific gravity was assigned to the block model based on the lithology code.

Extreme grades were restricted using an outlier approach. Assay data were composited on 3 m intervals, broken at lithology boundaries. Variography was completed in MineSight software on total copper and molybdenum grades for block grade estimation.

Ordinary kriging (OK) with a two-pass estimation approach was used for total copper and molybdenum block grade estimation. Grade estimation was completed within each domain (combination of lithology and the area above and below the primary sulfides surface). The estimation plan was divided into four regions. For blocks that were not estimated, an average value was assigned based on the domain the block fell within.

Model validation included visual and geostatistical methods. These suggested no major biases in the estimate. Wood performed a review of available reconciliation data based on the quarterly and annual variances from 2016–2020, and noted the following: from 2016 to end of year 2020, no significant bias in the copper grade; from 2016 to end of year 2020, the resource model over-estimated the molybdenum grade by between 10–25%; the 2021 resource model over-estimates the copper grade >0.3% Cu cut-off grade and under-estimates the ore tonnage above the cut-off grade.

Mineral resources were initially classified by Southern Copper based on a combination of the average distance to the nearest drill holes and the kriging variance. Wood reviewed the classification criteria using a distance to data algorithm. There was a significant portion of measured assigned to areas the where the drill spacing was >100 m. A number of higher-confidence classification blocks were assigned on the basis of a single drill hole and were clustered around that drill hole. In addition, the kriging variance and distance to the closest composite did not always properly represent the drill hole spacing. As a result, the measured material was downgraded to indicated.

Wood constrained the mineral resource estimates within conceptual pit shells using a Lerchs–Grossmann algorithm. Commodity prices used in resource estimation were based on Southern Copper's interpretations of market analysis from analyst and bank forecasts. The estimated timeframe used for the price forecasts is the 50-year LOM based on the mineral reserve estimates. The cut-off grade used for mineral resource estimation for sulfide material was 0.146% Cu. Low-grade sulfide material to be sent to the leach dumps was reported at a cut-off grade of 0.052% Cu. Wood considers those blocks within the constraining resource pit shell and above the cut-offs applied to have reasonable prospects for economic extraction.

No estimates for gold, silver, or other precious metals were performed. Molybdenum was not reported in the mineral resource for leachable material as molybdenum cannot be recovered using the leach process.

1.10.2 Mineral Resource Statement

- Mineral resources are reported using the mineral resource definitions set out in S-K 1300, and are reported exclusive of those mineral resources that were converted to mineral reserves. The reference point for the mineral resource estimate is in situ. The indicated mineral resource estimates for the Toquepala Operations are provided in Table 1-1. The inferred mineral resource estimates are included in Table 1-2. Wood is the QP Firm responsible for the estimate. The mineral resources were prepared by, or under the supervision of qualified persons with relevant experience in mineral resource estimation for porphyry copper deposits.

Table 1-1: Indicated Mineral Resource Statement

Process Type	Tonnage (Mt)	Cu (%)	Mo (%)	Contained Cu (Mlb)	Contained Mo (Mlb)
Sulfide	1,584.2	0.43	0.024	15,060.6	829.2
Leach (Low-grade sulfides)	521.2	0.09	-	1,024.8	-
Total	**2,105.4**	**0.35**	**-**	**16,085.4**	**829.2**

Table 1-2: Inferred Mineral Resource Statement

Process Type	Tonnage (Mt)	Cu (%)	Mo (%)	Contained Cu (Mlb)	Contained Mo (Mlb)
Sulfide	2,406.7	0.39	0.019	20,939.9	1,010.2
Leach (Low-grade sulfides)	2,306.0	0.08	-	4,158.9	-
Total	**4,712.7**	**0.24**	**-**	**25,098.8**	**1,010.2**

Note: (1) Mineral resources are reported in place and are current as at December 31, 2022. Mineral resources are reported exclusive of mineral reserves. Wood is the QP Firm responsible for the estimate.

(2) Mineral resources are reported within a conceptual pit shell that uses the following input parameters: metal prices of US$3.80/lb Cu and US$11.50/lb Mo; average metallurgical recovery of 88.2% for copper and 68.1% for molybdenum from a process plant and 16.1% copper recovery from a heap leach; base mining costs of US1.87/t; mill process operating costs of US$7.68/t, leach operating costs of US$0.70/t; copper concentrate payable price of US$3.37/lb Cu, molybdenum concentrate payable price of US$9.72/lb Mo, and leach copper payable price of US$ 3.77/lb Cu.

(3) No estimates for molybdenum are reported for leachable material as this element cannot currently be recovered using the leach process envisaged.

(4) Numbers in the table have been rounded. Totals may not sum due to rounding.

Areas of uncertainty that may materially impact the mineral resource estimates include: changes to long-term metal price and exchange rate assumptions; changes in local interpretations of mineralization geometry such as presence of unrecognized mineralization off-shoots; faults, dikes and other structures affecting the interpreted continuity of mineralized zones; changes to geological and grade shapes, and geological and grade continuity assumptions; changes to metallurgical recovery assumptions; changes to the input assumptions used to derive the conceptual open pit shell that is used to constrain the estimates; changes to the cut-off values applied to the estimates; variations in geotechnical (including seismicity), hydrogeological and mining assumptions; and changes to environmental, permitting and social license assumptions. Wood's qualified person is of the opinion that all issues relating to all relevant technical and economic factors likely to influence the prospect of economic extraction can be resolved with further work.

1.11 Mineral Reserve Estimates

1.11.1 Estimation Methodology

Indicated mineral resources were converted to probable mineral reserves by applying modifying factors within a mining study that meets at least prefeasibility level. Inferred mineral resources were set to waste.

Mineral reserves were constrained within an optimized pit shell that included consideration of appropriate pit revenue factors, reconciliation data, projected year-end 2022 topography, geotechnical pit slope recommendations, metallurgical recoveries, operating costs (mining, processing, general and administrative (G&A), smelting, refining and processing costs, SX/EW and selling costs), royalties, metal prices, and net smelter return (NSR) cut-offs.

To define the ultimate reserve pit for sulfide resources amenable to a concentration process, a variable NSR cut-off value was applied ranging from US$10.84/t to US$12.64/t. For mineral resources amenable to the leaching process, a NSR cut-off value of US$0.819/t (but below the variable NSR cut-off value) was used to define material sent to this destination.

The mine plan considers a strategy of an elevated cut-off for the first four years with the purpose of increasing early cash flows, the following elevated cut-off grades for Cu were used to define the material that goes directly to the mill/concentrator:

- Year 2023 to 2025: ≥0.25 % Cu
- Year 2026: ≥0.24 % Cu
- Year 2027 to 2073: ≥0.23% Cu.

Material below the selected cut-off grades is sent to leaching if it is above the cut-off grade for that process.

1.11.2 Mineral Reserve Statement

Mineral reserves are reported using the mineral reserve definitions and standards set out in S-K 1300. The reference point for the mineral reserves estimate is delivery to the process facility. Mineral reserves are summarized in Table 1-3. No proven mineral reserves have been estimated. The leach ore existing in the leach dumps is reported as leach in process.

Wood is the QP Firm responsible for the mineral reserve estimates. Qualified persons with relevant experience in reserve estimation for open pit mining operations involving porphyry deposits prepared or supervised the preparation of the mineral reserve estimates. The estimates are current as of December 31, 2022.

Table 1-3: Probable Mineral Reserve Statement

Process Type	Tonnes (Mt)	Copper Grade (%)	Molybdenum Grade (%)	Contained Copper (Mlb)	Contained Molybdenum (Mlb)
Concentration	2,144.6	0.47	0.021	22,157.2	1,014.0
Leach	708.6	0.16	—	2,549.5	—
Leach in process	1,794.7	0.15	—	6,118.7	—
Total	**4,647.9**	**0.30**	**—**	**30,825.4**	**1,014.0**

Note: (1) Mineral reserves are current as of December 31, 2022. Wood is the QP Firm responsible for the estimate.

(2) Mineral reserves are constrained within a smoothed designed pit based on copper and molybdenum only. The following parameters were used in estimation: assumption of open pit mining methods; assumption of concentration and leaching processes; copper price of US$3.30/lb, molybdenum price of US$10.00/lb; variable NSR cut-off values of US$10.84–US$12.64/t-processed for concentration material; a NSR cut-off value of US$0.819/t-processed for leaching material; mining recovery of 100%; 6% mining dilution; 22% reduction factor applied to molybdenum grade; variable metallurgical recoveries (average LOM recoveries of 88.2% for copper by concentration, 68.1% for molybdenum by concentration, and 16.1% for copper by leaching excluding leach ore existing in leach dumps, and 8.0% for copper by leaching including leach ore existing in leach dumps); average copper recoveries of 97.4% for smelting and 99.9% for refining; variable mining costs that range from US$2.46–US$4.26/t-mined; average process costs of US$8.384/t-processed for concentration material, and US$0.819/t-processed for leaching material; average smelting and refining cost of US$0.382/lb Cu; selling costs of US$-0.0024/lb Cu for concentration process, US$1.679/lb Mo for concentration process, and US$-0.009/lb Cu for leaching process; 1% NSR royalty applied to Cu and Mo; and 60% of the leachable material will be leached and processed by the SX/EW plant.

(3) Numbers in the table have been rounded. Totals may not sum due to rounding.

Areas of uncertainty that may materially impact the mineral reserve estimates include: changes to long-term metal price and exchange rate assumptions; changes to metallurgical recovery assumptions; changes to the input assumptions used to derive the mineable shapes applicable to the open pit mining methods used to constrain the estimates; changes to the forecast dilution and mining recovery assumptions; changes to the cut-off values applied to the estimates; variations in geotechnical (including seismicity), hydrogeological and mining assumptions; and changes to environmental, permitting and social license assumptions.

1.12 Mining Methods

The Toquepala Operations use conventional truck-and-shovel open pit mining methods.

Geotechnical zones used for pit designs were based on guidance provided by a third-party consultant. Overall slope angles were estimated based on the 2021 year-end reserve pit design.

Seven pit phases remain in the life-of-mine (LOM) plan, starting with phase 5 and ending with phase 11. Three pit phases will be operational at any one time, to ensure that production rates can be met. A maximum mining capacity per phase of 200 Mt/a is assumed, with a maximum vertical advance rate of 10 benches per year. The mine plan assumed a maximum mining capacity of 260 Mt of annual movement and a nominal processing rate of 120 kt/d of sulfide ore delivered to the concentrator and 140 kt/d of leachable material to the leach facility.

The mill crusher is located at elevation 3,260 masl in the southern zone of the pit. From the crusher, the crushed material is transported using a 2.0 km long conveyor belt to the west through a tunnel to the ore stockpiles in the concentrator plant. The mill crusher throughput is a nominal 120 kt/d.

Material destined for heap leach can be sent either directly to the leach pad, or to the leach crusher that is located at elevation 3,255 masl in the southern zone of the pit. Once crushed, the material is conveyed via a 6.5 km long conveyor to the leach pad. The leach crusher has a nominal capacity of 140 kt/d, and the conveyor has a transport capacity of 8,350 t/h.

Mining equipment is conventional and consists of drill, load, haul and support equipment.

1.13 Recovery Methods

The process designs were based on existing technologies and proven equipment, and the process plants are installed and operating, and have multi-decade operating history.

The LESDE plant has a current annual production capacity of 56,336 t of cathode copper, and includes conventional processes used for the recovery of copper such as acidic leaching of low-grade dumps, SX and EW facilities. Copper is recovered from two sources, loaded pregnant leaching solution (PLS) coming from the Cuajone Operations oxide leaching plant, and low-grade heap leach dumps at the Toquepala mine. The sulfuric acid required is produced by acid plants located at the Ilo smelter.

The Toquepala C1 concentrator started operations in 1959 and, following numerous upgrades, has a current capacity of 60,000 t/d. The Toquepala C2 concentrator started operations in November 2018, with a design capacity of 60,000 t/d. The ore in both plants is treated in a conventional concentration circuit consisting of crushing, grinding and flotation of copper and molybdenum minerals. The copper concentrate is transported by rail to the Ilo smelter for treatment and the molybdenum concentrate is bagged and sold as a final product.

The Ilo smelter processes the copper concentrates from the Cuajone and Toquepala concentrators and produces copper anodes for the Ilo refinery. In 2007 a new smelter was commissioned at Ilo, with a nominal capacity of 1,200,000 t/a of copper concentrate. The smelter consists of one single Isasmelt smelting unit associated with two rotary holding furnaces, four Peirce Smith converters, two anode furnaces associated with twin anode casting wheels, two acid plants, two oxygen plants, and auxiliary services plants.

The Ilo refinery is located in the Pampa de Caliche at 9 km north of the city of Ilo. The plant was acquired by Southern Copper in 1994 and modernized to produce 246,000 t/a of copper cathodes. It was subsequently expanded to the current annual capacity of 294,763 t/a of copper cathodes. The Ilo refinery has the capacity to produce 125,000 kg Ag, 840 kg Au, and 50,000 kg Se annually. Although the Ilo refinery has produced these elements historically as by-products, their revenues and process costs are excluded from the mine plan and cash flow analysis since silver, gold, and selenium are not included in the mineral resource or mineral reserve estimates.

The Toquepala Operations use surface and underground water from a variety of sources as a fresh make up water. All sources discharge into the Pampa de Vaca lagoon from where the fresh water is supplied to the various process plants.

The primary consumables in the various process plants include:

- LESDE plant: sulfuric acid, diluent, extractant, cobalt sulfate and grain refining
- Concentrators: flotation reagents such as: collectors, frother, flocculant, sodium hydrosulfide, and lime; steel grinding media.

Power is sourced for process needs from the Peruvian grid.

1.14 Infrastructure

All required infrastructure to support the Toquepala Operations is in place. Additional tailings storage will be required to support the LOM plan after approximately the end of 2036.

On-site infrastructure that supports the Toquepala Operations include: an open pit; four WRSFs; two coarse (crushed) ore stockpiles; two low-grade sulfide leach dumps; process facilities (concentrator plants, LESDE plant, conveyor systems); warehouses, workshops, and offices; 138 kV and 220 kV power transmission lines; electrical substation and power distribution system; water handling facilities; permanent camp for operations; railway and rail yard.

Off-site infrastructure includes: access road; 138 kV and 220 kV power transmission lines; electrical substations and power distribution systems; railway; Quebrada Honda TSF; water supply system; smelter, refinery and sulfuric acid plants at Ilo; port facilities in Ilo including dock and storage areas, rail yard, and wagon repair shop; port facilities in Tablones, where hydrocarbons and sulfuric acid are unloaded and sent to the mine site; and the Simón railway yard, which has assembly and dispatch areas, as well as workshops and offices.

Railways extend from Ilo to Toquepala, and a spur railway runs from the Toquepala Operations to the Cuajone Operations. Supplies such as sulfuric acid, equipment, fuel, and mining supplies are transported to the operations using the rail network. Concentrates are railed from the mine site to the Ilo smelter/refinery, and cathodes produced at the refinery are railed to the Port of Ilo. The Port of Ilo is a private port, operated by Southern Copper. It has two berths, and can take vessels to 40,000 tonnes deadweight. The port is the export point for copper cathodes, copper concentrate, sulfuric acid and molybdenum; and the import location for general containerized and loose cargo to support operations.

The Quebrada Honda TSF is the repository for tailings from the Toquepala and Cuajone Operations, and commenced operations in December 1996. It is located southwest of the Toquepala Operations and south of the Cuajone Operations. The TSF operates as a cross-valley impoundment and is confined by two dams constructed of cyclone tailings sand. The remaining capacity of the existing TSF will support operations until approximately the end of 2036.

A new TSF is contemplated in the LOM plan when the Quebrada Honda TSF reaches capacity in approximately the end of 2036.

The stormwater management system includes two collection ponds located to the north of the open pit, which are designed to retain a probable maximum precipitation event from the Andean sector of the pit. Water captured by the dikes is sent to a storage pond, and is used for dust mitigation along the roadways. No waters are discharged from the operations as no mining effluents are generated at the mine site. At Quebrada Honda, Southern Copper is authorized to dispose of decanted water from the tailings. Water from the TSF is used in the process plant, following treatment in a neutralization facility.

Collectively, the Toquepala and Cuajone Operations, together with the Ilo smelter/refinery complex, have five accommodations areas, which provide a permanent accommodation capacity of 4,756 persons.

The energy supply for the Toquepala Operations comes from the National Intercontected Electric System (SEIN), primarily from natural gas-fired thermal power plants located in the Chilca–Lima district of Peru, and from the Antunez de Mayolo and Cerro del Aguila hydroelectric power plants. Power is transmitted to the Southern Copper facilities in transmission networks of 500, 220 and 138 kV, using two Southern Copper-owned transmission lines. At each facility, power is stepped down using a series of sub-stations and distributed to the areas and equipment requiring electricity.

Fresh water for the mine and process facilities is obtained from both ground and surface sources: Huaitire and Vizcachas groundwater wells; Suches lagoon; and the Tacalaya and Honda streams. Water is transported by a network of pipelines to the operations, where it is stored in the Pampa de Vaca reservoir, located approximately 6 km northeast of the Toquepala mine.

1.15 Market Studies

Copper futures are exchange-traded contracts on all of the world's major commodity exchanges. Copper is the world's third most widely used metal after iron and aluminum and is primarily consumed in industries such as construction and industrial machinery manufacturing. The Toquepala Operations produce copper concentrates and copper cathodes.

Molybdenum is mainly used as an alloying agent in stainless steel, and also in the manufacture of aircraft parts and industrial motors. Molybdenum futures are available for trading in The London Metal Exchange (LME). Prices are generally determined by principal-to-principal negotiations between producers, trading houses, and end users. The Toquepala Operations produce molybdenum concentrates.

Southern Copper employs a corporate strategy that is in line with the company's marketing experience, and experience with obtaining long-term contracts with strategic business partners in the Asian and European markets, as well as annual contracts with other active market participants.

Depending on concentrate quality, the concentrates are primarily sold onto Asian or European market. Normally over 60% of the molybdenum concentrate is sold to Chile, with the remainder sold into the Northern Europe, Asia and the US markets. Cathode copper is sold onto the Asian, European, Brazilian and/or North American markets.

Southern Copper provided Wood with Southern Copper's internal price forecast and a presentation on their market outlook in the form of a slide deck. The commodity price forecast covered the period 2022-2026 and provided a long-term forecast for 2026 onward. Forecasts were based on Southern Copper's interpretations of market analysis from Wood Mackenzie, CRU and 23 analysts and banks on copper price, and six analysts and banks on molybdenum price.

Wood reviewed the Southern Copper long-term forecast price for copper of US$3.30/lb, and concluded that the copper price selected by Southern Copper is reasonable as it is consistent with Wood's assessment of industry consensus on long-term copper price used for reserve estimation and cash flows in the mining industry.

It is industry-accepted practice to use a higher long-term metal price for the mineral resource estimates than the pricing used for mineral reserves and cash flows. The long-term copper price forecast of US$3.30/lb for mineral reserves was increased by 15% to provide the mineral resource estimate copper price assumption of US$3.80/lb.

Wood reviewed the Southern Copper long term forecast price for molybdenum of US$10.00/lb, and concluded that the molybdenum price selected by Southern Copper is reasonable compared to what others have recently been using for mineral reserves and cash flows in the mining industry. The Southern Copper molybdenum long-term price forecast of US$10.00/lb was increased by 15% to US$11.50/lb to provide the input to the mineral resource constraining pit shell and NSR cut-off applied to the mineral resource.

Mineral reserves and mineral resources were constrained by pit shells that used inputs from copper and molybdenum only, with no other metal revenue contribution to the NSR value determinations. The economic analysis also excluded any revenue contribution from by-products generated by the Ilo smelter and refinery.

The long-term metal price forecasts used were fixed over the life of mine of 50 years and are:

- Mineral resources:
  - Copper: US$3.80/lb
  - Molybdenum: US$11.50/lb

- Mineral reserves and cash flows:
  - Copper: US$3.30/lb
  - Molybdenum: US$10.00/lb.

The exchange rate used was US$1.00 = PENS/3.81. This exchange rate was provided by Southern Copper.

Toquepala Operations concentrates are sent to the Ilo Smelter and Refinery for processing to produce refined cathodes. When the production from the Toquepala and Cuajone Operations exceeds the smelter's capacity, a portion is sold to third parties. In recent years, these third-party sales of Toquepala and Cuajone Operations concentrates have represented about 20–25% of the annual production. Approximately 95% of the production of refined cathodes is sold under annual contracts with industrial customers (mainly copper rod producers), with whom Southern Copper has had a commercial relationship for many years, and about 5% is sold on the spot market.

The largest in-place contracts other than for product sales cover items such as bulk commodities, operational and technical services, mining and process equipment, and administrative support services. Contracts are negotiated and renewed as needed. Contract terms are typical of similar contracts that Southern Copper has entered into in Peru.

1.16 Environmental, Permitting and Social Considerations

1.16.1 Environmental Studies and Monitoring

Baseline studies were done prior to mine start-up, and included assessments of air quality, noise and groundwater quality, flora and fauna surveys, and the human environment, including archaeological surveys. The data collected were used in support of the Environmental Impact Assessment (EIA).

As per permit requirements, Southern Copper has a number of monitoring programs in place, and monitors ground water, air quality, noise and biology in accordance with the commitments made in the Environmental Management and Adjustment Plan, Environmental Impact Study, Closure Plans and updates to those plans and studies.

1.16.2 Closure and Reclamation Considerations

Mine closure measures were developed in accordance with the Toquepala Mine Closure Plan Modification, approved under Directorial Resolution (R.D.) N° 079-2016-MEM-DGAAM. An updated Mine Closure Plan is under MINEM evaluation. Closure costs are included in the mine site financial model as cash costs on an annual basis. The current closure plan was completed in January 2022. For this assessment, the Quebrada Honda TSF closure costs and the Ilo Smelter and Refinery closure costs were allocated to the Cuajone and Toquepala Operations proportionally to nominal mill feed throughputs of each and the total LOM concentrate fed by each mine, respectively. A provision was included to account for the closure cost of the filtered tailings plant and dry-stack facility assumed.

The total closure cost estimate assumed in the economic analysis is US$355.7 million. The estimate is inclusive of the Peruvian general sales tax.

1.16.3 Permitting

The Toquepala Operations and the Ilo Smelter and Refinery have all of the required permits to operate. The operations maintain a permit register, which includes a record of the legal permits obtained, the approval authority, permit validity period and expiration dates, permit status (current, canceled or replaced) and whether or not the permit requires renewal. The operations also have a control and monitoring system to ensure that the requirements of each permit are monitored to comply with the relevant regulatory conditions imposed.

Additional permits will be required for the new TSF and for WRSFs.

1.16.4 Social Considerations, Plans, Negotiations and Agreements

The EIA completed in 2014 found no populations or cultivated areas that could be directly influenced by the Toquepala Operations. Southern Copper has community programs as part of its Social Management Plan that focus on a number of key goals, including: co-existence with local communities on a good neighbors basis; promotion of local economic development; and promotion of individual community member capabilities. Reasonable mechanisms are being implemented to maintain relationships with surrounding communities, to mitigate any perceived social conflicts that could be associated with the Project.

Southern Copper has communication channels and tools in place, based on the company's community development model, which allow the company to identify potential conflicts early, to work with the community to find appropriate solutions to address their concerns, and generate positive social license conditions for the continued operation of Southern Copper's mining projects.

Wood's qualified person is of the opinion that the current plans to address any issues related to environmental compliance, permitting, and local individuals or groups are adequate to support mineral resources and mineral reserves.

1.17 Capital Cost Estimates

Capital cost estimates are at a pre-feasibility level of accuracy range of ±25% and a contingency not exceeding 15%. All capital costs were expressed in Q3 2022 US dollars.

In general, the Toquepala Operations have the necessary facilities to carry out the current operations. Sustaining capital costs were estimated by area and allocated over time to support the proposed mine production schedule at current production throughputs.

A truckshop expansion is required in approximately 2024.

Mine equipment requirements were estimated by operating area (drilling, loading, hauling, support, etc.) based on the proposed LOM plan and equipment replacement ratios provided by Southern Copper. Mine equipment maintenance costs were also accounted for in the capital cost estimate.

Additional land is required for the development of WRSFs to support the LOM mine production schedule. Land acquisition costs were included in the cost estimate.

The costs associated with the raise of the existing Quebrada Honda TSF account for the works to expand the TSF to its maximum design storage capacity until approximately the end of 2036. Costs were distributed between the Cuajone and Toquepala Operations proportionally to nominal mill feed throughputs of each.

Additional tailings storage capacity is required once the Quebrada Honda TSF reaches capacity. Wood assumed that a filtered tailings plant and dry-stack facility would be constructed in the Quebrada Honda TSF area, as limited space is available within the Toquepala site.

Sustaining costs at US$0.8 million each year and US$16.5 million every three years were included for relocating conveyors for continued operation, equipment replacement associated with the conveyor systems, and additional cost related to changing/updating filtering equipment.

A filtered tailings pilot plant with a production capacity between 8 and 10 kt/d is currently under construction near the Quebrada Honda TSF area. The remaining cost estimated by Southern Copper to complete the construction of this facility was included and distributed between the Cuajone and Toquepala Operations proportionally to nominal mill feed throughputs of each.

Cost allocations were made for the relocation of the low-grade sulfide crusher.

Process facilities sustaining and maintenance costs, and other general sustaining and maintenance costs were accounted for based on unit costs derived from a five-year (2023-2027) sustaining and maintenance cost schedule developed by Southern Copper.

The sustaining capital cost estimate totals US$8,739.0 million (Table 1-4), exclusive of value-added taxes.

Table 1-4: Sustaining Capital Cost Estimate

Area	Sustaining Capital Cost (US$M)
Mining equipment	4,499.7
Truckshop expansion	32.1
Waste dumps development	30.3
Existing tailings storage facility (Quebrada Honda) raise	137.7
Filtered tailings plant, including land acquisition and pilot plant	996.1
Primary crusher relocation	66.9
Process facilities sustaining and maintenance	2,518.2
Other general sustaining and maintenance	457.8
Total	**8,739.0**

Note: Numbers have been rounded. Totals may not sum due to rounding.

1.18 Operating Cost Estimates

Operating cost estimates are at a pre-feasibility level of accuracy range of ±25% and a contingency not exceeding 15%.

Operating costs were based on actual costs and data from Southern Copper's operating mines in Peru, Wood's experience and the proposed mine and process plans.

The total material mined is estimated at 9,303 Mt. Mine operating costs are forecast to average US$2.12/t mined over the LOM. The mine cost increases gradually starting at US$1.94/t mined in Year 1 (2023) to a cost of US$2.51/t mined in year 50 (2072), due to the increase in ex-pit hauling distance (WRSFs) and the deepening of the pit.

In addition to mining costs, costs associated with the material preparation for leaching at the crushed ore leach dump (referred to as the Quebalix facility) are also accounted for in this area.

Process operating costs were based on a combination of actual costs averages over the period 2018–2022, adjusted to account for the LOM based on expected variations of key commodities costs such as energy, consumables and services; and a projection of the leaching and SX/EW costs provided by Southern Copper based on the leach and cathodes production schedule and operational parameters and main consumable costs based on data from their operations.

Operating costs were allocated to the planned dry-stack facility that will be required once the Quebrada Honda TSF reaches capacity in approximately the end of 2036. A cost of US$1.99/t was estimated, which includes tailings filtering/drying, tailings conveying and placement of tailings on a dry-stack facility. The operating cost of the filtered tailings pilot plant was also included and distributed between the Cuajone and Toquepala Operations proportionally to nominal mill feed throughputs of each.

General and administrative costs are included in the corresponding mining and processing costs.

Table 1-5 is a summary of the operating cost estimates, exclusive of value-added taxes.

As Southern Copper assumes, in its cashflow planning, that the Tia Maria Project will source the required sulfuric acid for that operation from the Ilo smelter and refinery at the cost of production, which represents approximately 720,000 t/a, or about 60% of the total acid production from the Ilo smelter, over approximately 20 years. This sulfuric acid production cost was removed from the Ilo smelter operating costs.

Table 1-5: LOM Operating Cost Estimate

Description	Total (US$M)	Unit Cost	
Mining	19,901.8	US$/t mined*	2.14
Process	25,069.7	US$/t processed**	8.79
Total	**44,971.5**		

Note: Numbers have been rounded. Totals may not sum due to rounding.
* Including preparation costs at the crushed ore leach dump (Quebalix facility)
** Including ore for concentration and leaching, excluding existing material in leach dumps

1.19 Economic Analysis

1.19.1 Forward-Looking Information Caution

Certain information and statements contained in this section are forward-looking in nature and are subject to known and unknown risks, uncertainties, and other factors, many of which cannot be controlled or predicted and may cause actual results to differ materially from those presented here. Forward-looking statements include, but are not limited to, statements with respect to the economic and study parameters of the Toquepala Operations; mineral reserves; the proposed mine plan and mining strategy; ability of mine designs to withstand seismic events; dilution and extraction recoveries; processing method and rates and production rates; projected metallurgical recovery rates; infrastructure requirements; capital, operating and sustaining cost estimates; concentrates and cathodes marketability and commercial terms; the projected LOM and other expected attributes of the Project; the net present value (NPV); future metal prices and currency exchange rates; government regulations and permitting timelines; estimates of reclamation obligations; requirements for additional capital; environmental and social risks; and general business and economic conditions.

1.19.2 Methodology

The financial analysis was performed using a discounted cash flow (DCF) method. Net annual cash flows were estimated projecting yearly cash inflows (or revenues) and subtracting projected yearly cash outflows (such as capital and operating costs, royalties, and taxes).

The financial model that supports the mineral reserve declaration was a standalone model that calculated annual cash flows based on: scheduled ore production; assumed processing recoveries; metal sale prices; projected operating and capital costs; and estimated taxes.

The financial analysis was based on an after-tax discount rate of 10%. Cash flows were assumed to occur at the end of each year and were be discounted to the beginning of 2023 (Year 1 of the economic analysis).

Costs projected within the cash flows are based on constant Q3 2022 US dollars.

Revenue was calculated from the recoverable metal and the long-term forecasts of metal prices and exchange rates. Recoverable metal and products include those recovered at the Ilo smelter and refinery from the copper concentrate feed from the mine operation.

1.19.3 Key Parameters and Assumptions

The cashflow assumes, based on Southern Copper's forecast, that on average, in those years when the total annual copper concentrate production from Cuajone and Toquepala Operations is equal or less than the Ilo Smelter nominal capacity (1.2 Mt/a of Cu concentrate), all the copper concentrate from the Cuajone and Toquepala Operations will be treated at the Ilo smelter; in those years when the total annual copper concentrate production from Cuajone and Toquepala Operations exceeds the Ilo smelter nominal capacity up to 10%, 90% of the copper concentrate from the Cuajone and Toquepala Operations will be treated at the Ilo smelter, with the remaining 10% sent to third parties; and in those years when the total annual copper concentrate production from Cuajone and Toquepala Operations exceeds the Ilo smelter nominal capacity in more than 10%, the copper concentrate from the Cuajone and Toquepala Operations will be treated at the Ilo smelter at nominal capacity, with surplus concentrate production sent to third parties.

Typically, about only about 4.5% of the copper anodes produced are sold to third parties; the remainder is sent to the Ilo refinery for cathode production.

Copper and molybdenum concentrate transport costs were based on average costs incurred from 2020 to August 2022. Copper concentrate transport losses were based on benchmark. Concentrate moisture contents were based on average values from 2021 to August 2022. Commercial terms were applied to the portion of the copper concentrate that is assumed to be sold to third parties and to molybdenum concentrate and copper cathode sales.

Approximately 88% of the sulfuric acid produced is sold within South America, with 60% of that acid production figure going to Chile, and 40% to Peru. The remaining 12% is used in the Cuajone and Toquepala Operations. Southern Copper assumes, in its cashflow planning, that the Tia Maria Project will source the required sulfuric acid for that operation from the Ilo smelter and refinery at the cost of production, which represents approximately 720,000 t/a, or about 60% of the total acid production from the Ilo smelter. All other revenue from acid sales apart from that from the Tia Maria project have been excluded from the financial model.

Special mining taxes and the modified mining royalty are included in the economic analysis.

Closure costs were allocated in the relevant cashflow years based on the progressive, final and post closure schedule. It was assumed that closure cost accruals are not required, and closure obligations will be satisfied by either escrow with other Southern Copper assets as collateral, a bond or a bank letter of credit. The salvage value was assumed to be zero.

The taxation modeled within the financial analysis is based on the taxation scheme that was provided and validated by Southern Copper.

1.19.4 Economic Analysis

The Toquepala Operations are anticipated to generate a pre-tax NPV of US$3,018.5 million at a 10% discount rate and an after-tax NPV of US$1,818.1 million at a 10% discount rate.

As the mine is operating, and the initial capital is sunk, considerations of IRR and payback are not relevant.

Cashflow summary results are provided in Table 1-6.

Table 1-6: Summary of Economic Results

Description	Unit	Value
Remaining mine life	years	50
Copper payable	Mlb	19,641.9
Molybdenum payable	Mlb	691.1
After-Tax Valuation Indicators		
Undiscounted cash flow	US$M	9,461.6
NPV @ 10.0%	US$M	1,818.1
Sustaining capital	US$M	8,739.0
Closure cost (inc. IGV)	US$M	355.7
Mining operating cost	US$M	19,901.8
Process operating cost	US$M	25,069.7

Note: Numbers have been rounded. IGV = value-added tax (Impuesto General a las Ventas

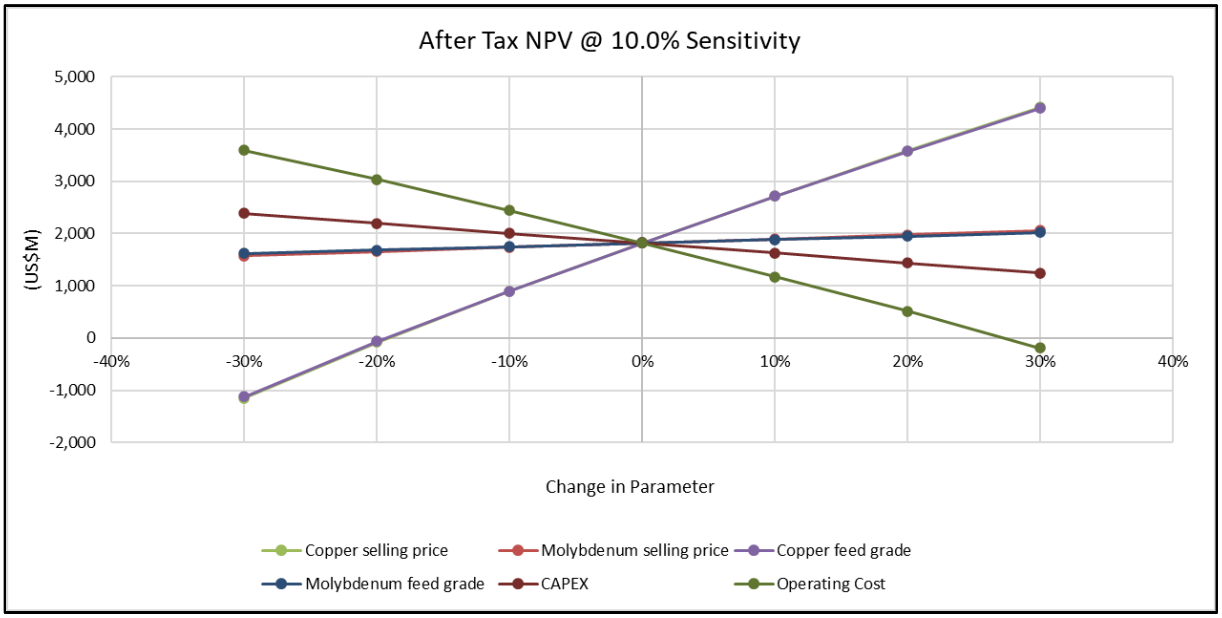
1.19.5 Sensitivity Analysis

A sensitivity analysis was performed to identify potential impacts on the after-tax NPV of variations in metal prices, grades, sustaining capital costs and operating costs. The results of this analysis are presented in Figure 1-1. For the purpose of the sensitivity to metal grades, it was assumed that the capacity of the processing facilities is not a constraint.

The Toquepala Operations are most sensitive to fluctuations in copper price and grade. It is less sensitive to changes in operating costs and capital costs. The operations are least sensitive to variations in molybdenum price and grade.

Table 1-7 presents the Toquepala operation after-tax NPV at a range of discount rates from 8-12% with the base case highlighted.

Figure 1-1: After-Tax NPV Sensitivity (10% discount rate)



(Source: Wood, 2022)

Table 1-7: After-Tax NPV Sensitivity to Discount Rates (base case is highlighted)

Discount Rate	After-Tax NPV (US$M)
NPV @ 8%	2,182.5
NPV @ 9%	1,981.7
NPV @ 10%	**1,818.1**
NPV @ 11%	1,682.2
NPV @ 12%	1,567.2

1.20 Risks and Opportunities

Factors that may affect the mineral resource and mineral reserve estimates were identified in Chapter 1.10.2 and Chapter 1.11.2 respectively.

1.20.1 Risks

Risks to the Toquepala Operations include:

- The mineral reserve estimates are sensitive to metal prices. Lower metal prices than forecast in the LOM plan may require revisions to the mine plan, with impacts to the mineral reserve estimates and the economic analysis that supports the mineral reserve estimates.
- Geotechnical and hydrological assumptions used in mine planning are based on historical performance, and to date historical performance has been a reasonable predictor of current conditions. Any changes to the geotechnical, including seismicity, and hydrological assumptions could affect mine planning, affect capital cost estimates if any major rehabilitation is required due to a geotechnical (seismic) or hydrological event, affect operating costs due to mitigation measures that may need to be imposed, and impact the economic analysis that supports the mineral reserve estimates.
- The Quebrada Honda TSF does not have sufficient storage capacity for the LOM. The mine plan assumes that a new facility location can be obtained, designs can be completed and approved by the relevant regulatory authorities, and the new facility can be constructed and commissioned prior to approximately the end of 2036. If the TSF is not available by the time envisaged, this could affect the mineral reserves, capital and operating cost estimates, and the economic analysis.
- Wood has assumed that the new TSF will be a dry-stack facility and has estimated capital and operating costs for such a facility. If the final TSF option uses a different disposal method, this could affect the mineral reserves, capital and operating cost estimates, and the economic analysis.
- The new Global Industry Standard on Tailings Management (GISTM) provides a set of industry Standard to guide design and management of TSF's. Members and non-members of International Council on Mining and Metals (ICMM) are required to be in compliance with the GISTM over the next several years. The TSF design needs to be revisited and be revised as needed to be in full compliance with the recently-published global tailings standard (GISTM, 2020). This may result in changes to the design criteria. Such changes may result in increases to the capital cost estimates, and changes to the operating cost estimates, which could affect the mineral reserve estimates.
- Labor cost increases or productivity decreases, particularly due to the impact of Covid-19, could also impact the estimated mineral reserves, operating cost estimates and the economic analysis.

- Commodity price increases for key consumables such diesel, electricity, tires, and chemicals would negatively impact the stated mineral reserves because of the effect on the forecast operating costs.
- Assumed permitting and project development timelines may be longer than anticipated for the new TSF.
- Political risk from challenges to mining licenses and/or Southern Copper's right to operate.

1.20.2 Opportunities

Opportunities include:

- Conversion of some or all of the indicated mineral resources currently reported exclusive of mineral reserves to mineral reserves, with appropriate supporting studies
- Upgrade of some or all of the inferred mineral resources to higher-confidence categories, such that such better-confidence material could be used in mineral reserve estimation and potentially reduce the mining costs through reduced waste rock to be mined
- Considering an elevated cut-off strategy over a longer period of the mine life and revision of the life of mine plan could result in a better economic outcome
- Higher metal prices than forecast could present upside sales opportunities and potentially an increase in predicted Project economics.

1.21 Conclusions

Under the assumptions in this Report, the operations evaluated show a positive NPV over the remaining LOM and support the mineral reserves. The mine plan is achievable under the set of assumptions and parameters used.

1.22 Recommendations

The recommendations cover the discipline areas of data storage, mineral resource estimates, tailings storage and permitting. The total recommended budget estimate to complete the programs is US$1.5–US$2.2 million.

Recommendations include:

- Internal controls:
  - Establish a controlled documents database to store copies of internal protocols, and sign-offs, management plans, and registers
- Database:
  - Implement a document storage system for all supporting documentation
  - Complete a verification program on recovery, logging, and density data and ensure that only verified data are included in the Project database
- Mineral resources:
  - Complete a capping study and implement a grade capping/outlier restriction process in the next mineral resource update
- Mine plan:
  - Review the mine plan to assess opportunities to optimize the mining sequencing and expansion of the elevated cut-off over the life of mine
- Quebrada Honda TSF:
  - Revisit and revise TSF designs to be in full compliance with the recently-published global tailings standard
- Future tailings and waste management:
  - Review the most appropriate storage mechanisms and alternatives for these materials for the LOM after approximately the end of 2036 and devise the most appropriate designs given storage requirements and site conditions
- Permitting
  - Determine what surface rights will need to be obtained in support of the preferred tailings and waste rock storage plan and the path needed to secure these rights and conclude the necessary agreements with current surface rights holders
  - Determine the permitting path, and numbers and types of permits and authorizations required to construct and operate the selected tailings and waste rock storage facility
  - Confirm if any additional baseline studies will be required in support of permit applications for the preferred tailings and waste rock storage facility.

2.0 INTRODUCTION

2.1 Registrant

This technical report summary (the Report) was prepared for Southern Copper Corporation (Southern Copper) by Wood Group USA, Inc. (Wood, acting as the QP Firm) on the Toquepala Operations (the Project), located in the province of Tacna, Tacna Department, Peru (Figure 2-1).

The Toquepala Operations contain the Toquepala deposit.

2.2 Terms of Reference

2.2.1 Report Purpose

The Report was prepared to be attached as an exhibit to support mineral property disclosure, including mineral resource and mineral reserve estimates, for the Toquepala Operations in Southern Copper's Form 10-K for the year ending December 31, 2022.

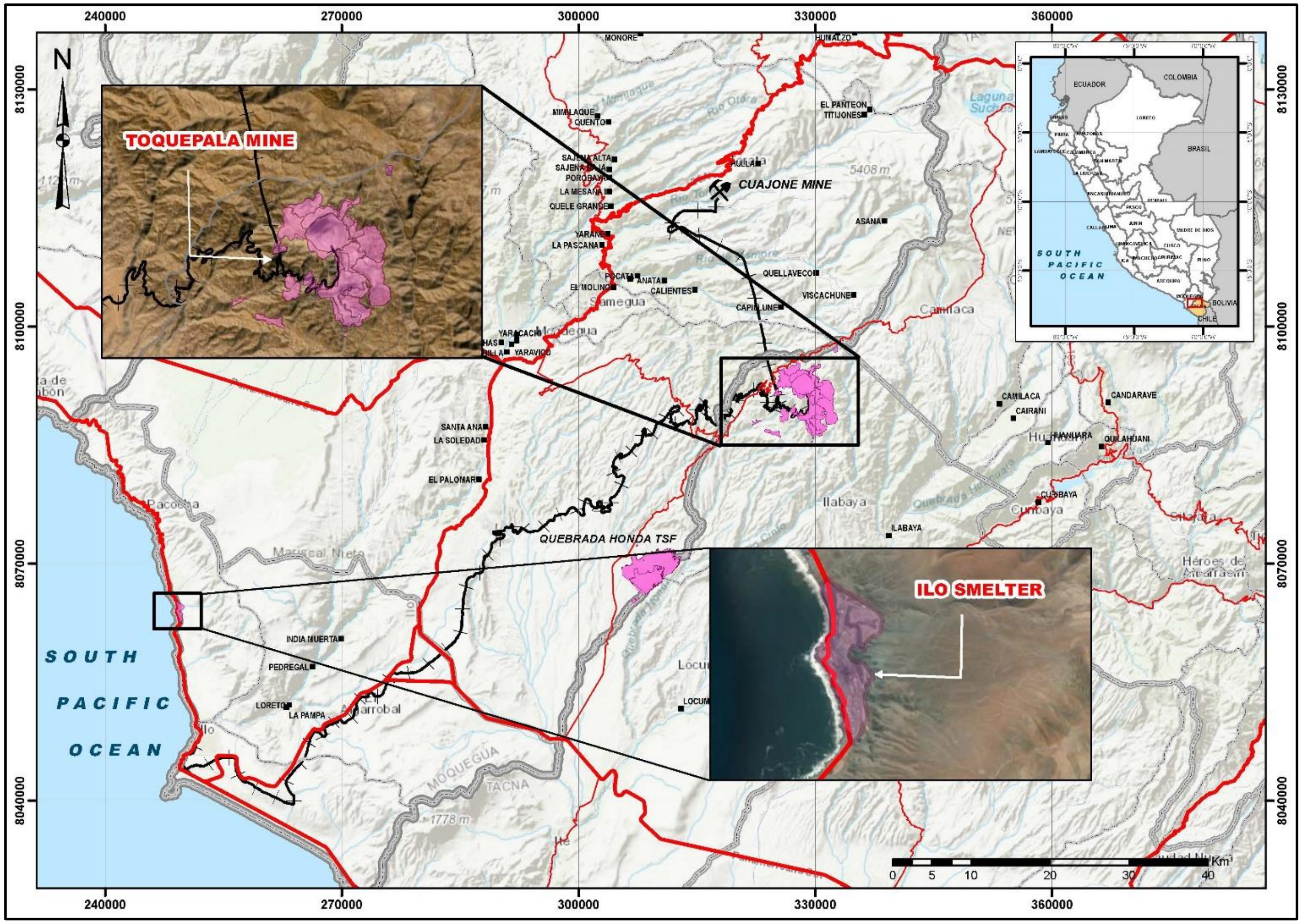
2.2.2 Terms of Reference

Unless otherwise indicated, all financial values are reported in United States (US) currency (US$) including all operating costs, capital costs, cash flows, taxes, revenues, expenses, and overhead distributions.

Unless otherwise indicated, the metric system is used in this Report.

Mineral resources and mineral reserves are reported using the definitions in Subpart 229.1300 – Disclosure by Registrants Engaged in Mining Operations in Regulation S–K 1300 (S-K 1300). The Report uses US English.

Figure 2-1: Project Location Plan



(Source: Wood, 2022)

2.3 Qualified Persons

Wood is using the allowance for a third-party firm consisting of mining experts to date and sign the Report.

Wood had appropriate individual Qualified Persons (QPs) prepare the content that is summarized in this Report.

A portion of the information was provided by Southern Copper as the registrant as set forth in Chapter 25. Wood has relied on the registrant for the information specified in Chapter 25.

2.4 Site Visits and Scope of Personal Inspection

Wood QPs and support staff visited the Project site. The scope of inspection by each discipline area is summarized in Table 2-1.

2.5 Report Date

Information in the Report is current as of December 31, 2022.

2.6 Information Sources

The reports and documents listed in Chapter 24 and Chapter 25 of this Report were used to support Report preparation.

2.7 Previous Technical Report Summaries

This Report updates a previously filed technical report summary on the Project:

- Toquepala Operations, Peru, Technical Report Summary, current as at December 31, 2021, prepared by Wood Group USA, Inc.

Table 2-1: Scope of Personal Inspection by Wood

Discipline Area	Site Visit Date	Scope of Personal Inspection
Geology/mineral resources	23–25 September, 2021	• Presentation on the geology of the area by Southern Copper geologist • Review of QA/QC procedures with Southern Copper personnel • Visit to the core shed; inspection of reject and pulp storage area • Pit inspection, observed blast hole sampling • Inspected the on-site mine laboratory and observed sample preparation and analysis of blast hole samples.
Infrastructure	29–30 September, 2021	• Visited the water-related infrastructure, including water supply, potable water, tanks and reservoirs providing fresh and process water • Inspected/viewed mine facilities including the belt overland conveyor, workshops, warehouses, fuel tanks, plant, leach–solvent extraction (SX)–electrowinning (EW) (LESDE) plant, and leach dump • Toured the C1 and C2 concentrators plant, and viewed the associated workshops, warehouses • Viewed the camps, offices, schools, recreation infrastructure.
	1 October, 2021	Visited Quebrada Honda TSF. Also visited the refinery facilities, Tablones port terminal, Simón railway yard, foundry, offices and camps, dock, warehouses and workshops in the Puerto area.
Mining engineering	8 December, 2021	Visited and inspected the open pit and the primary crusher
	21-23 September, 2022	• Discussions with Southern Copper staff on aspects of mining • Visited and inspected the open pit and the primary crushers • Toured the Quebalix leach dump and SX-EW facility.
Process	6–8 December, 2021	• Inspected the two Toquepala concentrators, pumping station from Cuajone, and the leach dumps facilities • Discussions with Southern Copper staff on aspects of metallurgy and processing.

3.0 PROPERTY DESCRIPTION

3.1 Property Location

The Toquepala Operations are located in the Ilabaya District, Jorge Basadre Province, Tacna Department, and are situated approximately 150 km by road from the city of Tacna, 85 km from the city of Ilo and 35 km from the city of Moquegua.

The Project centroid is situated at 17° 17'05.85"S latitude and 70° 36'21.10"W longitude.

The center of the Toquepala open pit is located at approximately 17° 14.744'S and 70° 36.808'W.

The smelter and refinery are located at about 17° 29.855'S latitude and 71° 21.538'W longitude.

The Quebrada Honda TSF is located at approximately 17° 27.724'S latitude and 70° 47.810'W longitude.

3.2 Property and Title in Peru

Wood has not independently verified the following information which is in the public domain and have sourced the data from Elias (2019), Ernst and Young (2017), and KPMG (2016) as well as from official Peruvian Government websites.

3.2.1 Regulatory Oversight

The right to explore, extract, process and/or produce minerals in Peru is primarily regulated by mining laws and regulations enacted by Peruvian Congress and the executive branch of government, under the 1992 Mining Law. The law regulates nine different mining activities: reconnaissance; prospecting; exploration; exploitation (mining); general labor; beneficiation; commercialization; mineral transport; and mineral storage outside a mining facility.

The Ministry of Energy and Mines (MINEM) is the authority that regulates mining activities. MINEM also grants mining concessions to local or foreign individuals or legal entities, through a specialized body called The Institute of Geology, Mining and Metallurgy (INGEMMET).

Other relevant regulatory authorities include the Ministry of Environment (MINAM), the National Environmental Certification Authority (SENACE), the Supervisory Agency for Investment in Energy and Mining (OSINERGMIN), the Ministry for Agriculture, and the Ministry for Culture. The Environmental Evaluation and Oversight Agency (OEFA) monitors environmental compliance.

3.2.2 Mineral Tenure

Mining concessions can be granted separately for metallic and non-metallic minerals. Concessions can range in size from a minimum of 100 ha to a maximum of 1,000 ha.

A granted mining concession will remain valid providing the concession owner:

- Pays annual concession taxes or validity fees (derecho de vigencia), currently US$3/ha, by June each year. Failure to pay the applicable license fees for two consecutive years will result in the cancellation of the mining concession.
- Meets minimum expenditure commitments or production levels. The minima are divided into two classes:
  - Achieve "Minimum Annual Production" by the first semester of Year 11 counted from the year after the concession was granted, or pay a penalty for non-production on a sliding scale, as defined by Legislative Decree N° 1320 which became effective on 1 January, 2019. "Minimum Annual Production" is defined as one tax unit (UIT) per hectare per year, which is S/4,400 in 2021 (about US$1,220).
  - Alternatively, no penalty is payable if a "Minimum Annual Investment" is made of at least 10 times the amount of the penalty.

The penalty structure sets out that if a concession holder cannot reach the minimum annual production on the first semester of the 11th year from the year in which the concessions were granted, the concession holder will be required to pay a penalty equivalent to 2% of the applicable minimum production per year per hectare until the 15th year. If the concession holder cannot reach the minimum annual production on the first semester of the 16th year from the year in which the concessions were granted, the concession holder will be required to pay a penalty equivalent to 5% of the applicable minimum production per year per hectare until the 20th year. If the holder cannot reach the minimum annual production on the first semester of the 20th year from the year in which the concessions were granted, the holder will be required to pay a penalty equivalent to 10% of the applicable minimum production per year per hectare until the 30th year. Finally, if the holder cannot reach the minimum annual production during this period, the mining concessions will be automatically expired.

Title-holders of mining concessions that were granted before December 2008 were obliged to pay the penalty from 2019 if the title-holder did not reach either the Minimum Annual Production or make the Minimum Annual Investment in 2018.

Mining concessions will lapse automatically if any of the following events take place:

- The annual fee is not paid for two consecutive years.
- The applicable penalty is not paid for two consecutive years.
- The Minimum Annual Production Target is not met within 30 years following the year after the concession was granted.

Beneficiation concessions follow the same rules as for mining concessions. A fee must be paid that reflects the nominal capacity of the processing plant or level of production. Failure to pay such processing fees or fines for two years would result in the loss of the beneficiation concession.

3.2.3 Royalties

In 2011, the Peruvian Congress approved an amendment to the mining royalty charge. The mining royalty charge is based on operating income margins with graduated rates ranging from 1–12% of operating profits; the minimum royalty charge is equivalent to 1% of net sales. If the operating income margin is 10% or less, the royalty charge is 1% and for each 5% increment in the operating income margin, the royalty charge rate increases by 0.75%, to a maximum of 12%.

At the same time the Peruvian Congress enacted a Special Mining Tax that is also based on operating income. Rates range from 2–8.4%. If the operating income margin is 10% or less, the Special Mining Tax is 2%, and for each 5% increment in the operating income margin, the special mining rate increases by 0.4%, to a maximum of 8.4%.

3.2.4 Surface Rights

Mining companies must negotiate agreements with surface landholders or establish easements. Where surface rights are held by communities, such easements must be approved by a qualified majority of at least two thirds of registered community members. In the case of surface lands owned by communities included in the indigenous community database maintained by the Ministry of Culture, it is necessary to go through a prior consultation process before administrative acts, such as the granting of environmental permits, are finalized. For the purchase of surface lands owned by the government, an acquisition process with the Peruvian state must be followed through the Superintendence of National Properties.

Expropriation procedures have been considered for cases in which landowners are reluctant to allow mining companies to have access to a mineral deposit. Once a decision has been made by the Government, the administrative decision can only be judicially appealed by the original landowner as to the amount of compensation to be paid.

3.2.5 Water Rights

Water rights are governed by Law 29338, the Law on Water Resources, and are administered by the National Water Authority (ANA) which is part of the Ministry of Agriculture. There are three types of water rights:

- *License*: this right is granted in order to use the water for a specific purpose in a specific place. The license is valid until the activity for which it was granted terminates, for example, a beneficiary concession.
- *Permission*: this temporary right is granted during periods of surplus water availability.
- *Authorization*: this right is granted for a specified quantity of water and for a specific purpose. The grant period is two years, which may be extended for an additional year, for example for drilling.

In order to maintain valid water rights valid, the grantee must:

- Make all required payments including water tariffs
- Abide by the conditions of the water right in that water is only used for the purpose granted.

Water rights cannot be transferred or mortgaged. However, in the case of the change of the title holder of a mining concession or the owner of the surface land who is also the beneficiary of a water right, the new title holder or owner can obtain the corresponding water right.

3.2.6 Environmental Considerations

MINAM is the environmental authority, although the administrative authority is the Directorate of Environmental Affairs (DGAAM) of MINEM. The environmental regulations for mineral exploration activities were defined by Supreme Decree No. 020-2008-EM of 2008. New regulations for exploration were defined in 2017 by Supreme Decree No. 042-2017-EM.

An Environmental Technical Report (Ficha Técnica Ambiental or FTA) is a study prepared for approval of exploration activities with non-significative environmental impacts and less than 20 drilling platforms. The environmental authority has 10 working days to make observations.

An Environmental Impact Declaration (Declaración de Impacto Ambiental or DIA) has to be presented for Category I exploration activities which have a maximum of 40 drilling platforms or disturbance of surface areas of up to 10 ha. The environmental authority has 45 working days to make observations.

A semi-detailed Environmental Impact Study (Estudio de Impacto Ambiental Semi-Detallado or EIAsd) is required for Category II exploration programs which have between 40–700 drilling platforms or a surface disturbance of more than 10 ha. The environmental authority has 96 working days to make observations. The total process including preparation of the study by a registered environmental consulting company can take 6–8 months.

A full detailed Environmental Impact Study (Estudio de Impacto Ambiental Detallado or EIAd) must be presented for mine construction. The preparation and authorization of such a study can take as long as two years.

3.2.7 Permits

In order to start mineral exploration activities, a company is required to comply with the following requirements and obtain a resolution of approval from MINEM, as defined by Supreme Decree No. 020-2012-EM of 6 June 2012:

- Resolution of approval of the Environmental Impact Declaration
- Work program
- A statement from the concession holder indicating that it is owner of the surface land, or if not, that it has authorization from the owners of the surface land to perform exploration activities
- Water License, Permission or Authorization to use water
- Mining concession titles
- A certificate of non-existence of archeological remains (CIRA) whereby the Ministry of Culture certifies that there are no monuments or remains within a project area. However, even with a CIRA, exploration companies can only undertake earth movement under the direct supervision of an onsite archeologist.

3.2.8 Other Considerations

Producing mining companies must submit, and receive approval for, an environmental impact study that includes a social relations plan, certification that there are no archaeological remains in the area, and a draft mine closure plan. Closure plans must be accompanied by payment of a monetary guarantee.

In April 2012, Peru's Government approved the Consulta Previa Law (prior consultation) and its regulations approved by Supreme Decree N° 001-2012-MC. This requires prior consultation with any indigenous communities as determined by the Ministry of Culture, before any infrastructure or projects, in particular mining and energy projects, are developed in their areas.

Mining companies also have to separately obtain water rights from the National Water Authority and surface lands rights from individual landowners.

3.2.9 Fraser Institute Survey

Wood used the Investment Attractiveness Index from the 2021 Fraser Institute Annual Survey of Mining Companies report (the Fraser Institute survey) as a credible source for the assessment of the overall political risk facing an exploration or mining project in Peru. The Fraser Institute annual survey is an attempt to assess how mineral endowments and public policy factors such as taxation and regulatory uncertainty affect exploration investment.

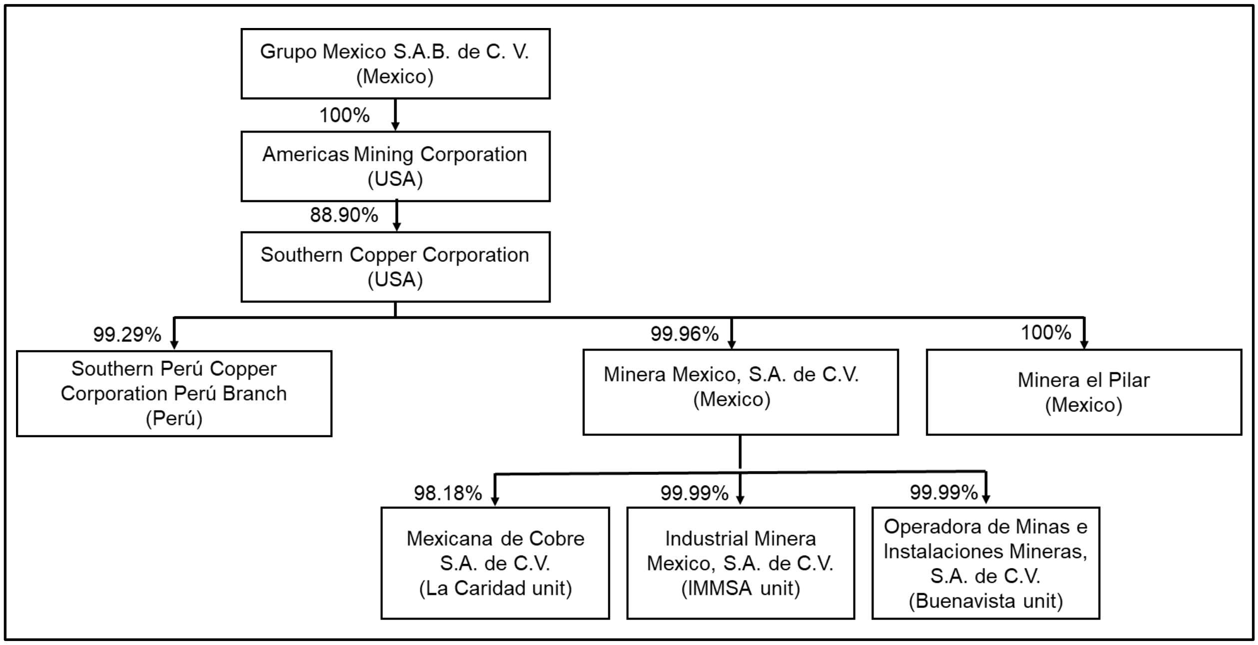
Wood used the Fraser Institute survey because it is globally regarded as an independent report-card style assessment to governments on how attractive their policies are from the point of view of an exploration manager or mining company senior management, and forms a proxy for the assessment by the mining industry of the political risk in Peru.

In 2021, the rankings were from the most attractive (1) to the least attractive (84) jurisdiction, of the 84 jurisdictions included in the survey. Peru ranked 42 out of 84 jurisdictions in the attractiveness index survey in 2021; 69 out of 84 in the policy perception index; and 24 out of 84 in the best practices mineral potential index.

3.3 Ownership

The Project is wholly owned by Southern Copper Corporation, Sucursal del Perú, which is a majority-owned, indirect subsidiary of Grupo Mexico S.A.B de CV. (Grupo Mexico). An ownership organogram is provided in Figure 3-1.

Figure 3-1: Ownership Organogram



(Source: Southern Copper, 2020)

3.4 Mineral Title

The Project consists of 14 mining concessions totaling 24,280 ha (Table 3-1). Concession locations are shown in Figure 3-2.

Mining concessions in Peru are laid out using a grid system delimited by Igemmet.

The annual holding fee is US$3.00/ha.

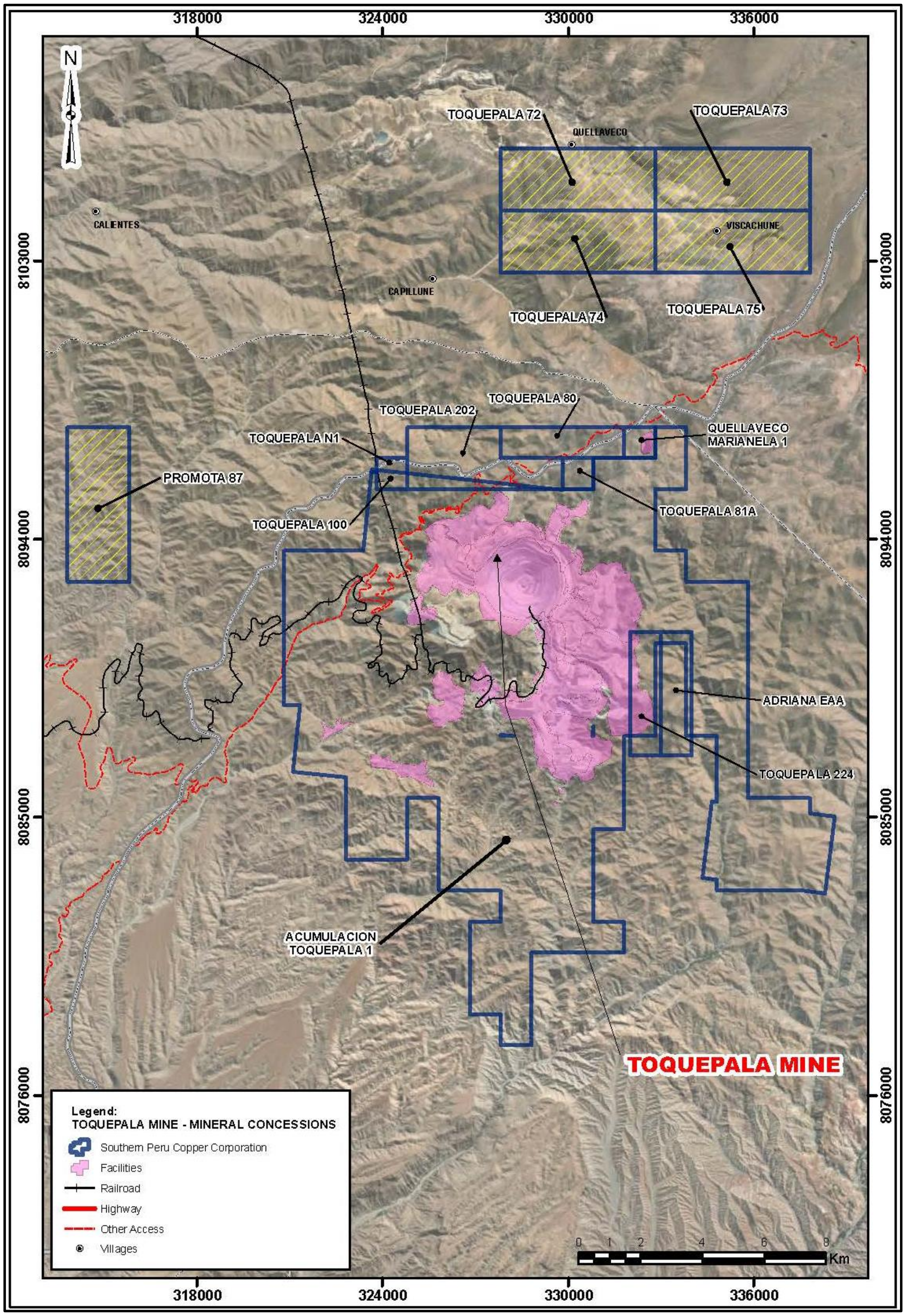
Table 3-1: Mineral Tenure

Concession Name	Area (ha)
Acumulación Toquepala 1	17,502.45
Quellaveco Marianela 1	100.00
Toquepala 100	43.92
Toquepala 202	679.19
Toquepala 72	997.34
Toquepala 73	1,000.00
Toquepala 74	1,000.00
Toquepala 75	1,000.00
Toquepala 80	400.00
Toquepala 81A	100.00
Toquepala N1	1.24
Promota 87	1,000.00
Toquepala 224	55.86
Adriana EAA	400.00
Total	**24,280.00**

Southern Copper also holds two beneficiation concessions:

- Toquepala Concentrator, registration code P0100414, granted on 6 November, 2002 for a processing rate of 60,000 t/d. The beneficiation concession has been amended on a number of occasions:
  - 14 April, 2015: increase in throughput rate to 120,000 t/d
  - 11 January, 2017: area expansion to cover 300.32 ha
  - 12 February, 2019: TSF embankment raise.
- Solvent extraction/electrowinning (SX/EW) Toquepala Leaching Plant, registration code P1100414, granted on May 7, 1996 for a processing rate of 11,850 t/d.

Figure 3-2: Mineral Tenure Location Plan



(Source: Wood, 2021)

3.5 Surface Rights

Southern Copper acquired land from private owners in support of the operations. In other areas, surface rights were granted by the Peruvian State in accordance with the law, either by the granting of old mining concessions or by the granting of surface rights (DUTES) for exclusive use.

Most of the surface rights are those granted by the Peruvian State because the operations are situated on uncultivated land owned by the State. Water easements, power lines, tunnels, industrial railroad line and tailings canal are authorized by the Peruvian State, as they are cross uncultivated land that is owned by the State. These surface rights will remain as long as the mining concession remains in force.

Southern Copper holds a "right of free use" on the uncultivated lands in the Toquepala mining concession and Quebrada Honda TSF areas. These surface rights will also remain as long as the mining concession remains in force.

There are granted easements covering the TSF and related facilities, the TSF pipelines, and water pipelines from the Suches lagoon to the Cuajone Operations (see also discussion in Chapter 15.10).

Portions of the waste rock storage facilities (WRSFs) required for the life-of-mine (LOM) plan are outside the current area of surface rights held by Southern Copper, and additional surface rights will need to be secured (see Chapter 17.4).

A new TSF will be required when the Quebrada Honda TSF reaches capacity by approximately end of 2036. Surface rights for the facility location will need to be acquired (see Chapter 17.4).

3.6 Water Rights

Southern Copper has both groundwater and surface water usage licenses, for a total extraction rate of 1,950 L/s. The rights are summarized in Table 3-2.

3.7 Royalties

Apart from the mining royalty (see Chapter 3.2.3) there are no royalty agreements pertinent to the Project.

Table 3-2: Water Rights

Area	Document Number	Water Right	Date
Surface water	R.S. N° 534-72-AG	License in process of adaptation of 150 L/s of the waters of the Ticalaya and Quebrada Honda	June 15, 1972
	R.M. N° 00405-77-AG/DGA	License in the process of adapting the use of 60 L/s of the waters of the Cinto-Quebrada Honda river	April 12, 1977
	R.D. N° 053-88-AG-DGA	Modification of the R.S. N° 535-72-AG reducing the flow to 300 L/s	April 10, 1988
	R.D. N° 271-2010-ANA/AAA I C-O	Regularization of the License for the use of surface water, reallocating volumes of the R.M. N° 405-77-AG/DGA	December 31, 2010
Groundwater	R.M. 00899-79-AA-AGAS	License to use a mass of 15,736,464 m^3 of groundwater through tubular wells drilled in the "Vizcachas" and "Titijones" hydrographic basins	July 09, 1979
	R.D. N° 0062-83-AG-DGASI	License to use an annual mass of up to 13,268,966 m^3 of groundwater extracted through four tube wells from the "Huaitire" basin	June 15, 1983
	R.A. N°169-95-DISRAGT-ATDRLIS	License to use groundwater in the Vizcachas basin of up to 360 L/s	July 12, 1995
	R.A. N° 002-94-DISRAG/ATDRL-S	License for the use of an annual mass of 5,991,840 m^3 of groundwater captured from tubular wells TP-11 and TP-12 drilled in the "Huaitire-Gentilar" hydrographic basin	1994
	R.A. N° 020-2003-ATDR.M/DRA.MDO	Adequacy of the water use license granted to in the R.M. N ° 00899-79-AA/DGAS and R.A. N° 002-94-DISRAG/ATDRL-S up to 9,744,624 m^3	April 1, 2003
	R.A. N° 034-2005-DRA.T/GR.TAC-ATDRL/S	Groundwater use license with a flow of 162.2 L/s equivalent to an annual mass of 5,115,139 m^3 captured by two tubular wells TP-14 and TP-15 located in the Huaitire-Gentilar basin	January 28, 2005

3.8 Encumbrances

There are currently no encumbrances such as liens, streaming agreements, etc. that could affect the LOM plan.

3.9 Permitting

Permitting and permitting conditions are discussed in Chapter 17.5 of this Report.

3.10 Violations and Fines

There are no current material violations or fines, as imposed in the mining regulatory context of the Mine Safety and Health Administration (MSHA) in the United States, that apply to the Toquepala Operations.

3.11 Significant Factors and Risks That May Affect Access, Title or Work Programs

To the extent known to Wood, there are no other significant factors and risks that may affect access, title, or the right or ability to perform work on the Project that are not discussed in this Report.

4.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

4.1 Physiography

The geography that surrounds the Toquepala Operations is marked by hills, small mountains and streams, with elevations ranging from 2,700–3,800 masl. Elevation of the mining operations is approximately 3,365 masl.

The general direction of water runoff from the area is from the northeast to the southwest. Streams have a dendritic drainage pattern and are typically ephemeral.

Vegetation types vary, depending on terrain elevation and proximity to the ephemeral watercourses. Vegetation commonly consists of scrub and grasslands. Dryer areas are characterized by cacti species. In desert areas, if there is vegetation, it consists of thorny plants and shrubs.

Crops are cultivated along the banks of the Cimarrona and Toquepala Creeks.

Using classifications developed by the Peruvian-Japanese Centre for Seismic Research and Disaster Mitigation (Cismid), the Project area straddles two seismic zones (JCI, 2020):

- *Destructive (VIII intensity)*: slight damage to specialized structures; considerable damage to well-built ordinary structures, with possible collapse; heavy damage to poorly-built structures; seriously damaged or destroyed masonry, and furniture completely moved out of place.
- *Very destructive (IX intensity)*: considerable damage to specialized structures, walls out of plumb; extensive damage to major buildings, with partial building collapse; and buildings displaced off foundations.

4.2 Accessibility

The mining operations are accessed from the city of Tacna via the Pan-American highway (Route 1S), and subsidiary roads TA-100, MO-107, TA-105, and TA-570, to the mine site. Alternative access is from Lima, using the Pan-American highway to the town of Alto Camiara, and then driving for 70 km on a paved road to the Toquepala camp.

The mine site is easily accessible from the cities of Arequipa, Moquegua, Tacna and Ilo, via the Panamericana Sur highway, to Alto Camiara, and then via the 70 km paved road to the Toquepala camp.

Within the operations area, access is by unpaved mine and exploration roads.

The Quebrada Honda TSF is 40 km south of the mine, and is accessed via the MO-107 route that that connects Alto Camiara with Toquepala.

The city of Tacna has a regional airstrip, with regular service within Peru.

4.3 Climate

Toquepala's climate is considered typical of desert conditions, with a Köppen and Geiger classification of BWk (arid cold; Climate-Data.org, 2020). Temperatures range from an average low of 1.3°C to an average high of 20°C (JCI, 2020)

Historical annual average precipitation is around 53 mm, with the highest amount of historical precipitation occurring in the month of February (21 mm on average). Foggy conditions are common.

Winds are typically southerly, varying from south–southwest to south, to south–southeast.

Mining operations are conducted year-round. Exploration activities are conducted year-round, but may be temporarily curtailed by rare heavy rainfall events.

4.4 Infrastructure

Infrastructure that supports the current operations is in place (see also discussions in Chapter 13, Chapter 14, and Chapter 15 of this Report). These Report chapters also discuss water sources, electricity, personnel, and supplies for the LOM plan.

The primary Project water source is the 370 km^2 Suches Lagoon (see discussion in Chapter 15.10), situated about 40 km east of the mine site at an altitude of approximately 4,450 masl. The lagoon is the product of glacial melt, and also feeds the Huaytire, Livelcalane and Humapalca rivers. Water is also sourced from three wells, Huaitire Gentilar, Titijones and Vizcachas that are located in upper hydrological basins to the east and west of the Suches Lagoon. All of the water sources provide good quality water.

The major electrical infrastructure in the Project general area includes the Aricota and Cuajone hydroelectric plants and several thermal power plants. The power grid is that of the Southern Interconnected System, which has six major electrical transmission lines.

Personnel live in mine accommodation villages adjacent the operations.

Tacna is the main source of supplies and fuel.

5.0 HISTORY

The exploration and development history is outlined in Table 5-1.

Table 5-1: Exploration and Development History

Date	Operator	Comments
18–19th century		Spanish Cateadores (explorers) and others
1930		G. Steinmann notes copper mineralization in the Toquepala area in his book "Geology of Peru"
1937	Cerro de Pasco Corporation (Cerro de Pasco)	Juan Oviedo Villegas delineates the central zone of the Toquepala deposit. Deposit recognized as a copper porphyry by A.C. Shmedeman, a geologist with Cerro de Pasco
1938–1942		• Cerro de Pasco entered into a purchase option. Work conducted included topographic and geological mapping, collection of 110 channel samples, covering an area of about 8 km^2. Excavated tunnels, completed 34 drill holes (7,620 m) • Cerro de Pasco allowed the purchase agreement to expire and subsequently American Smelting and Refining Company (ASARCO), through its subsidiary Northern Peru Mining and Smelting Company, entered into a new purchase option agreement on Toquepala.
1945	Northern Peru Mining	Cerro de Pasco loses the purchase option against Northern Peru Mining, a subsidiary of Asarco
1945–1949		• Exploration included underground tunneling and completed metallurgy and regional engineering, geology, and photogeology studies. Initial mineral resource estimate • Reviewed potential water sources for mining operations • Acquired full property rights in mid-1948.
1949–1955		Drilled 139 holes (41,300), of which 108 drill holes were percussion and 31 were core holes.; geological mapping. Updated mineral resource estimate.
1952–1954	Asarco	• Project engineering studies • Asarco entered into a bilateral agreement with the State of Peru for the development of the Toquepala operations in 1954.
1954	Southern Peru Copper Corporation	• Asarco, Cerro de Pasco, Newmont Mining Corporation and Phelps Dodge create Southern Peru Copper Corporation • Complete 10 percussion and 10 core holes in the deposit area.
1955–1998		• Mine construction activities, including construction of the railway line, workshops, offices, infrastructure, and preparation of the deposit area for mining • Various churn drill, core and reverse circulation drilling campaigns, totaling 170,000 m in 570 holes.

Date	Operator	Comments
1960		Toquepala mine and the Ilo smelter commenced operations
1999		Grupo Mexico acquired Asarco
2005		Southern Copper merged with Minera Mexico, the Mexican arm of Grupo Mexico
2016		• 35 core holes (18,855.90 m) for infill purposes • 12 core holes (3,619.85 m) for geotechnical purposes
2017		• 27 core holes (18,966.55 m) for infill purposes • 11 core holes (4,496.25 m) for geotechnical purposes
2018		• 16 core holes (11,931.15 m) for infill purposes • 100 core holes (16,600 m) for Cerro Azul project geological exploration • 17 core holes (6,158.40 m) for geotechnical purposes • Toquepala second 60 kt/d concentrator commenced operations
2019		• 32 core holes (25,627 m) for infill purposes • 15 core holes (8,099.15 m) for geotechnical purposes
2020		• 20 core holes (15,555 m) for infill purposes • 4 core holes (1,878.10 m) for geotechnical purposes
2021		• 11 core holes (9,643.90 m) for infill purposes • 2 core holes (1,000 m) for geotechnical purposes
2022		• 26 core holes (12,026.40 m) for infill purposes • 4 core holes (2,200 m) for geotechnical purposes

6.0 GEOLOGICAL SETTING, MINERALIZATION, AND DEPOSIT

6.1 Deposit Type and Mineralization

The Toquepala deposit is considered to be an example of a copper–molybdenum porphyry deposit.

Porphyry deposits range in age from Archean to Recent, although most are Jurassic or younger, and form in in a variety of tectonic settings. Most copper–molybdenum deposits are associated with low-silica, relatively primitive dioritic to granodioritic plutons that fall on the more oxidized, magnetite-series spectrum.

Deposits commonly form irregular, oval, solid or "hollow" cylindrical and inverted cup shapes. Orebodies can occur separately, overlap each other, or be stacked on top of each other. They are characteristically zoned, with barren cores and crudely concentric metal zones that are surrounded by barren pyritic halos with/without peripheral veins, skarns, replacement manto zones and epithermal precious-metal deposits. At the scale of ore deposits, associated structures can result in a variety of mineralization styles, including veins, vein sets, stockworks, fractures, “crackled zones” and breccia pipes.

Pyrite is typically the dominant sulfide mineral, in association with chalcopyrite, bornite, chalcocite, tennantite, enargite, other copper sulfides and sulfosalts, molybdenite and electrum.

6.2 Regional Geology

The basal regional geology consists of Precambrian metamorphic rocks that are cut by Paleozoic granite, unconformably overlain by Upper Triassic to Jurassic marine volcanic and sedimentary lithologies. Overlying these rocks are late Cretaceous to early Tertiary rhyolite, andesite, and agglomerate rocks of the Toquepala Group. The Toquepala Group is subdivided into the Huaracane, Inogoya, Paralaque, and Quellaveco Formations, with the volcanic component of the individual formations deposited subaerially.

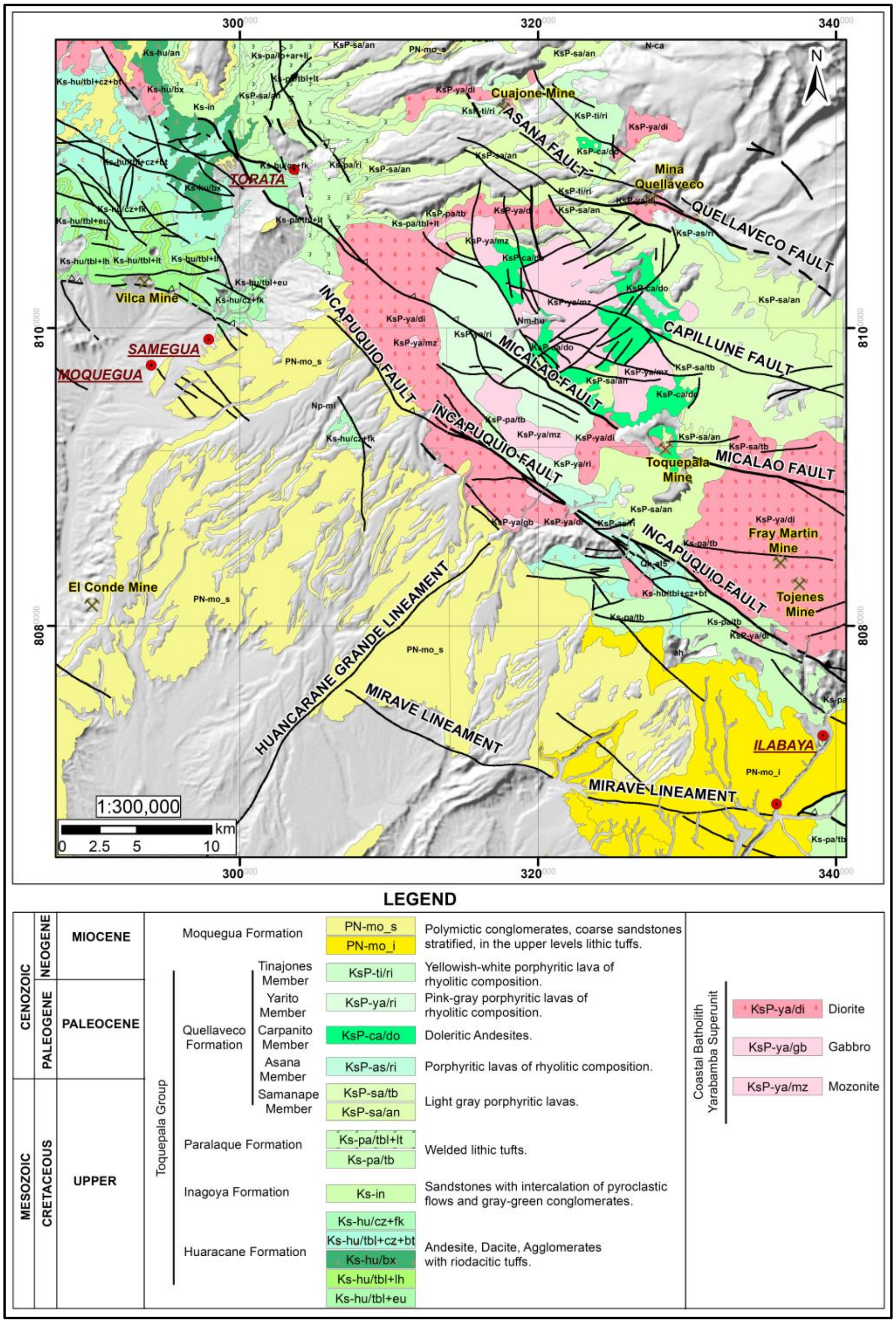
Figure 6-1 is a regional geology overview map, and Figure 6-2 shows geology in the general Project vicinity.

The Toquepala deposit is hosted mainly within latest Cretaceous rhyolitic and andesitic flows and ash fall deposits of the Toquepala Group and to a lesser extent within an Eocene dioritic batholith of the Yarabamba intrusive suite.

Figure 6-1: Regional Geology Map

(Source: Southern Copper, 2021). Note: Grid shown is South latitude and West longitude lines.

Figure 6-2: Regional and Project Geology



(Source: Southern Copper, 2022)

6.3 Local Geology

6.3.1 Lithologies and Stratigraphy

The sedimentary and volcanic stratigraphy of the Toquepala area is illustrated in Figure 6-3.

A sequence of several thousand meters of volcanic rocks assigned by Bellido and Landa (1965) and Bellido (1979) to the Paralaque and Quellaveco Volcanics of the middle and upper Toquepala Group is exposed in the Toquepala district. The Paralaque Volcanics (Bellido and Landa, 1965) constitute the oldest local member of the Toquepala Group and crop out only to the south of the Incapuquio Fault (refer to Figure 6-2), where the section is composed of andesite, dacite and rhyolite flows with minor volcaniclastic and conglomeratic lenses. Exposed to the north of the fault are lavas and ash-flows of the Quellaveco Formation (Bellido, 1979).

6.3.2 Structure

The regional-scale Incapuquio fault system influenced the location of the Late Cretaceous-Early Paleogene magmatism of the Toquepala Group, and locally juxtaposes volcanic rocks of the Toquepala Group and intrusive bodies and has been traced for over 140 km from the Chilean border to the outskirts of the town of Moquegua. The amount and sense of displacement are problematic: sinistral/transcurrent, normal (southwest side down), and dextral/reverse movements have been observed by various workers.

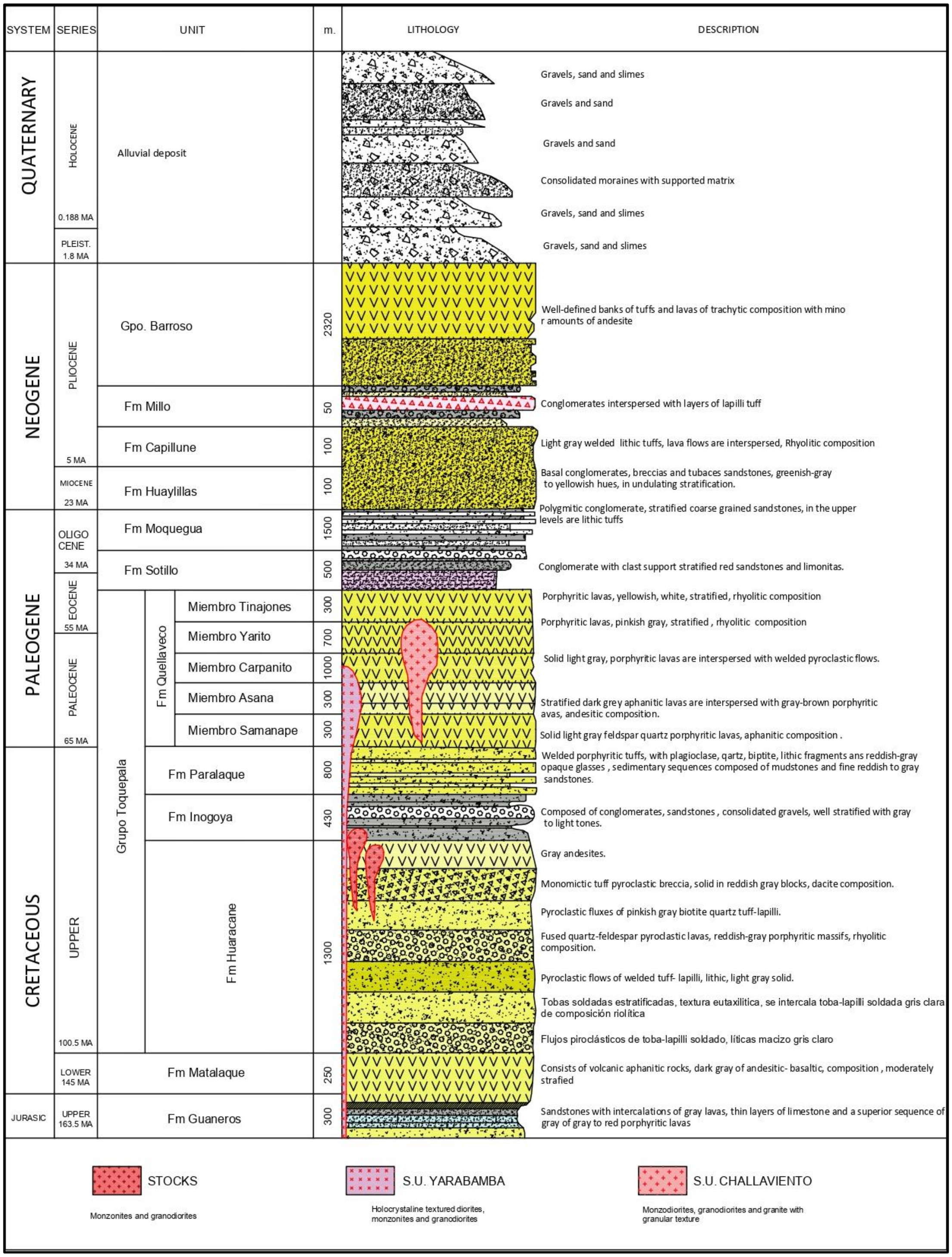
The Micalaco Fault, 6–7 km north of the Incapuquio fault system (refer to Figure 6-2), forms the southern boundary to the mineralization at Toquepala. It trends northwesterly, dips steeply, and has been traced for over 20 km. The fault zone is narrow throughout much of its course, but in the vicinity of the mine it broadens to several hundred meters.

The Toquepala Alignment is defined by dacite porphyry intrusions, breccias, and agglomerates trending 15–20°. This alignment crosses the mineralized zone in the central and eastern part of the pit, can reach 500 m in width, and is best developed north of the Micalaco Fault.

The Sargento and Yarito Faults and other secondary fault systems represent local alignments of breccias and faults.

Cretaceous and Tertiary volcanic strata in the mine area dip consistently at a low angle to the southwest. This tilting post-dates the extrusion of the regionally extensive ash-flow tuffs of the post-ore Huaylillas Formation and it is inferred that the Toquepala hydrothermal system has itself been tilted 5–20° to the southwest.

Figure 6-3: Stratigraphic Column



(Source: Martínez and Zuloaga, 2000)

Folds in the area exhibit north–northwest orientations and are parallel to the Incapuquio fault system. On a local scale, in the Quebrada Honda TSF area, there are folds of low amplitude (<25 m), with northwest–southeast directions. Two monoclines have been identified in the TSF area that show strongly-sheared folded layers.

6.3.3 Alteration Age

The age of the main hydrothermal and intrusive events related to copper mineralization is 55.0 ± 0.21 to 55.91 ± 0.4 Ma, based on dating of igneous biotite and hydrothermal sericite using $^{40}Ar/^{39}Ar$ techniques.

6.4 Property Geology

6.4.1 Deposit Dimensions

The deposit is ovoid, extending over a 3.3 x 3.5 km area. Mineralization has been drill tested to about 950 m from the original land surface. Drilling from within the pit base indicates primary mineralization extends for an additional 930 m below the pit bottom.

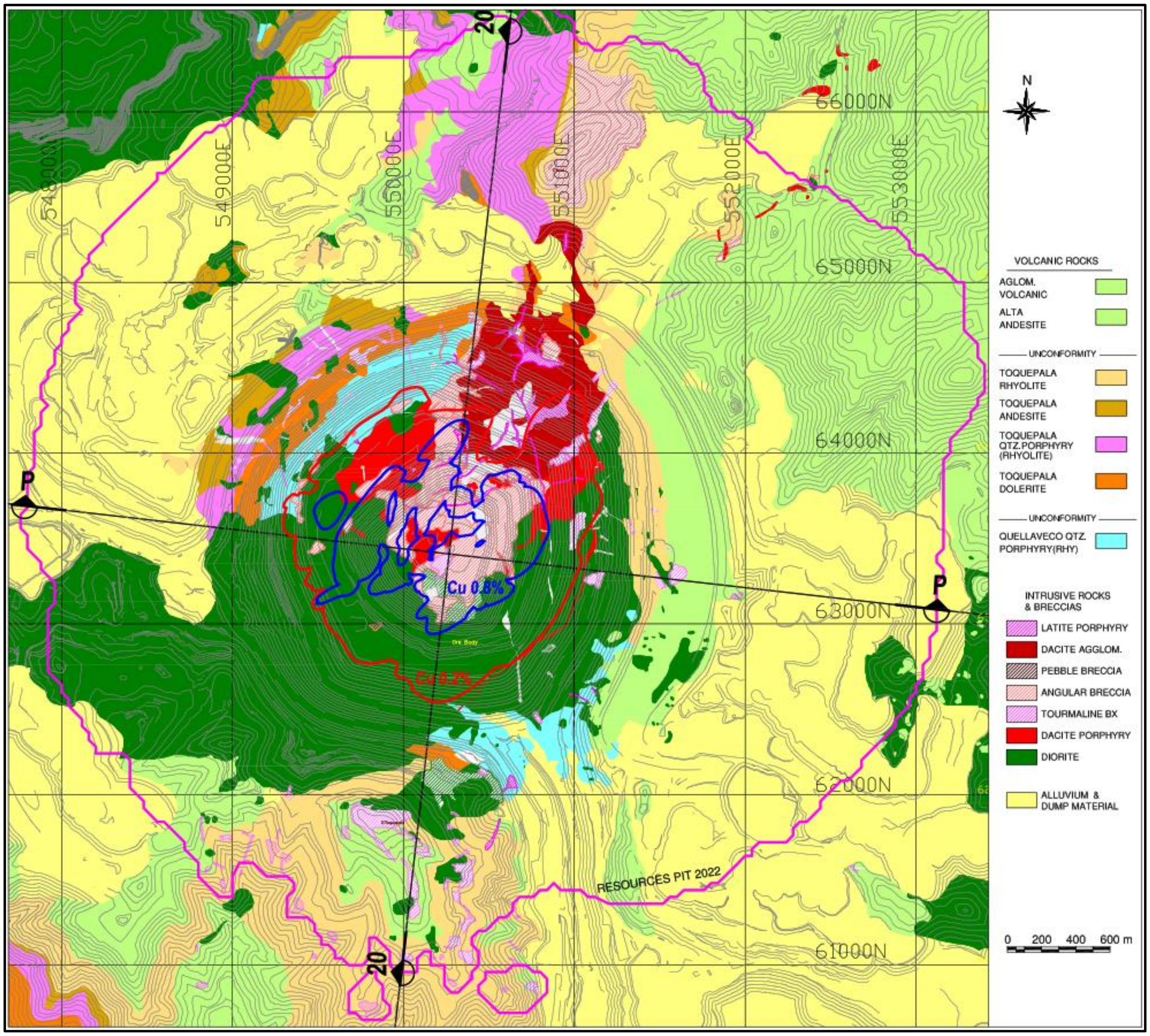
A geology map is provided in Figure 6-4. Cross-sections through the deposit are included as Figure 6-5 and Figure 6-6.

6.4.2 Lithologies

Mineralization is closely associated with a complex, 1,500 m diameter intrusive center dominated by four phases of porphyritic dacite plugs, referred to as "T", "Main", "L/M" and "Late", a dacite diatreme and agglomerates, extensive hydrothermal breccias and latite porphyry stocks and dikes.

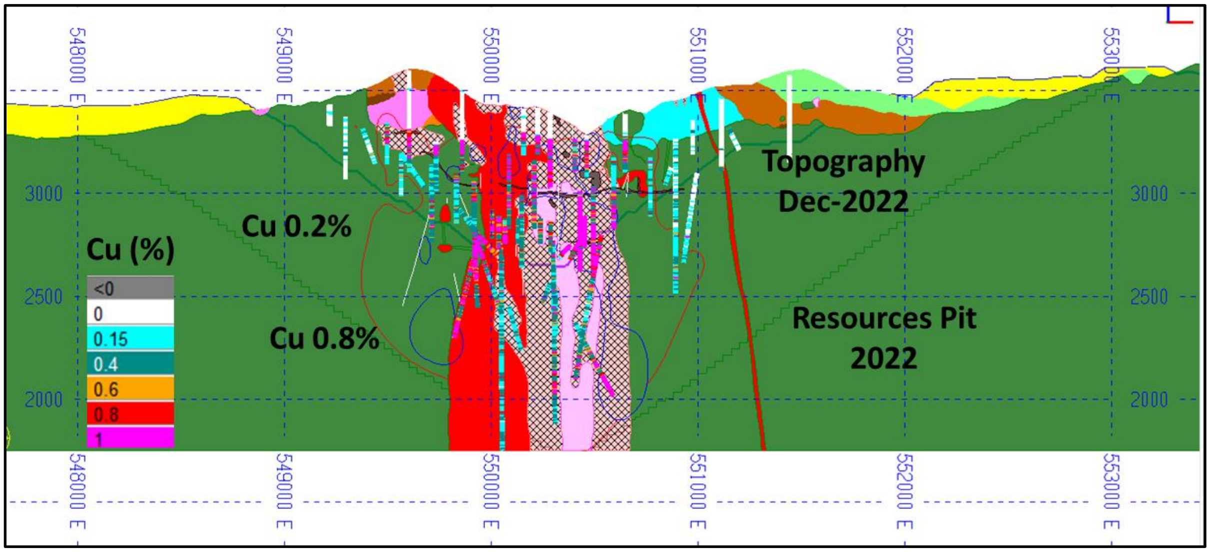
The main lithologies are volcanic units (Table 6-1), intrusive rocks (Table 6-2) and breccias (Table 6-3).

Figure 6-4: Toquepala Operations Geology Map



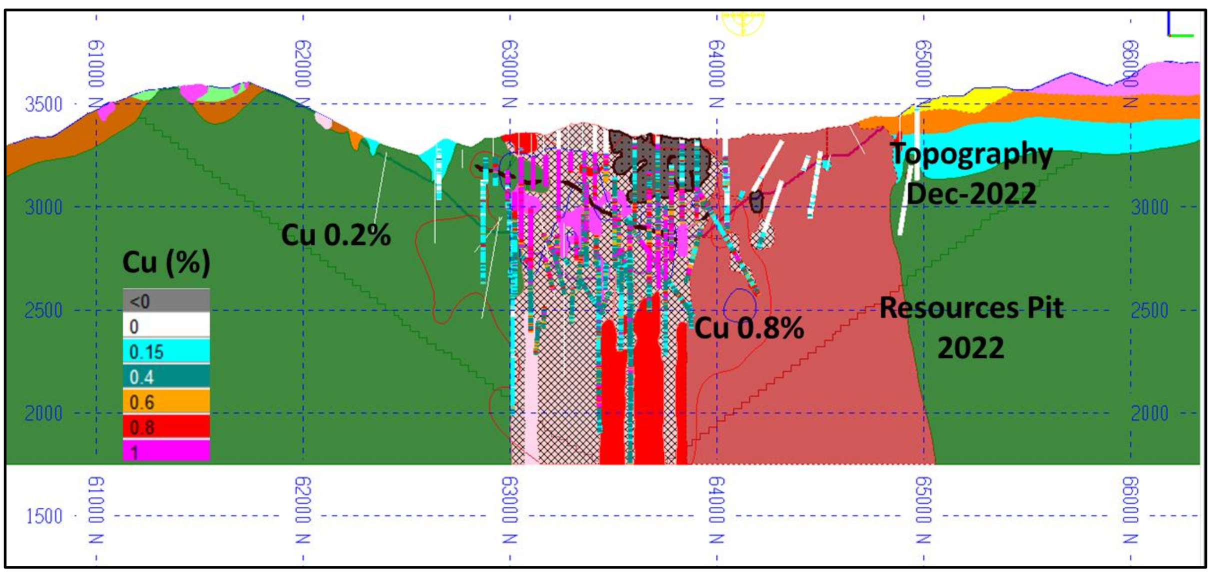
(Source: Wood, 2022)

Figure 6-5: Geological Cross-Section P



(Source: Wood, 2022). Legend key provided in Figure 6-4

Figure 6-6: Geological Cross-Section 20



(Source: Wood, 2022). Legend key provided in Figure 6-4

Table 6-1: Volcanic Rocks

Unit	Description
Upper Andesite	Andesite flows, breccias, agglomerates, and volcaniclastic rocks
Toquepala Rhyolite	Flow-banded rhyolites. Used as a marker bed within the overall stratigraphic section
Toquepala Andesite	Gray, aphanitic andesite lava flows
Toquepala Quartz Porphyry	Large concentration of medium to coarse grained quartz crystals. Can be locally silicified. Chlorite–epidote–calcite (propylitically) altered. secondary argillic alteration in the leached cap produced hematite and jarosite on fractures and fillings in cavities
Toquepala Dolerite	Black, aphanitic rock with high magnetic susceptibility. May be adjacent to an andesitic lapilli tuff. It is typically weakly to moderately chlorite–calcite–pyrite (propylitically) altered. Chalcopyrite occurs along fractures and veinlets
Quellaveco Quartz Porphyry	Cream–violet colored rhyolite with fluidal textures and fiamme. Chlorite–calcite–pyrite (propylitically) altered

Table 6-2: Intrusive Rocks

Unit	Description
Diorite	Porphyritic and medium to coarse grained. Chalcopyrite occurs with pyrite as disseminations and as fracture fillings. Molybdenite occurs as fracture fillings and disseminations. Alteration is dominantly weak to moderate chlorite–calcite–epidote–pyrite (propylitic). Some areas exhibit weak to moderate quartz–sericite alteration (phyllic) or weak to moderate silicification

Table 6-3: Breccias

Unit	Description
Angular breccia	Polymict fragments of dacite porphyry, diorite, tourmaline breccia, and latite porphyry in a gray silica matrix with chalcopyrite, molybdenite, and pyrite. Chalcopyrite fills cavities and "D" veins is disseminated in the matrix and fragments. Molybdenite fills fractures and "B" veinlets and is disseminated in the matrix. Strong to moderate quartz–sericite alteration (phyllic) was followed by moderate to weak quartz–K-feldspar–biotite ± chlorite (potassic) alteration.
Tourmaline breccia	Fragments of dacite porphyry in a matrix of tourmaline. Alteration is dominantly moderate chlorite–epidote–pyrite (propylitic). Tourmaline has also been recognized as sporadically disseminated clots, in veinlets, filling cavities and filling fractures.
Pebble breccia	Dike-like body of rounded, polymict fragments of diorite, dacite, latite porphyry, rhyolite, and andesite in the range of 1–20 cm in a matrix of rock flour and gray silica. In some areas, the matrix is latite porphyry. Mineralization consists of cavity filling and disseminated chalcopyrite, molybdenite, and pyrite. Sparse tourmaline and rhodochrosite veinlets. Weak to moderate chlorite–epidote–calcite–pyrite (propylitic) alteration occurs throughout this breccia. Minor quartz–sericite (phyllic) alteration and silicification occur locally.

6.4.3 Structure

Regional structures that were important in intrusive emplacement are outlined in Section 6.3.2.

In the mine area, the Toquepala Lineament appears to control some aspects of mineralization. The lineament is based on the distribution of three porphyry stocks, two breccia bodies, numerous pebble, and thin intrusive dikes within the mine, as well as the Cerro Toquepala, Cerro Azul and Totoral breccia pipes, along a 20° azimuth. The lineament is controlled by a north–northeast-trending pre-mineral fault system.

6.4.4 Alteration

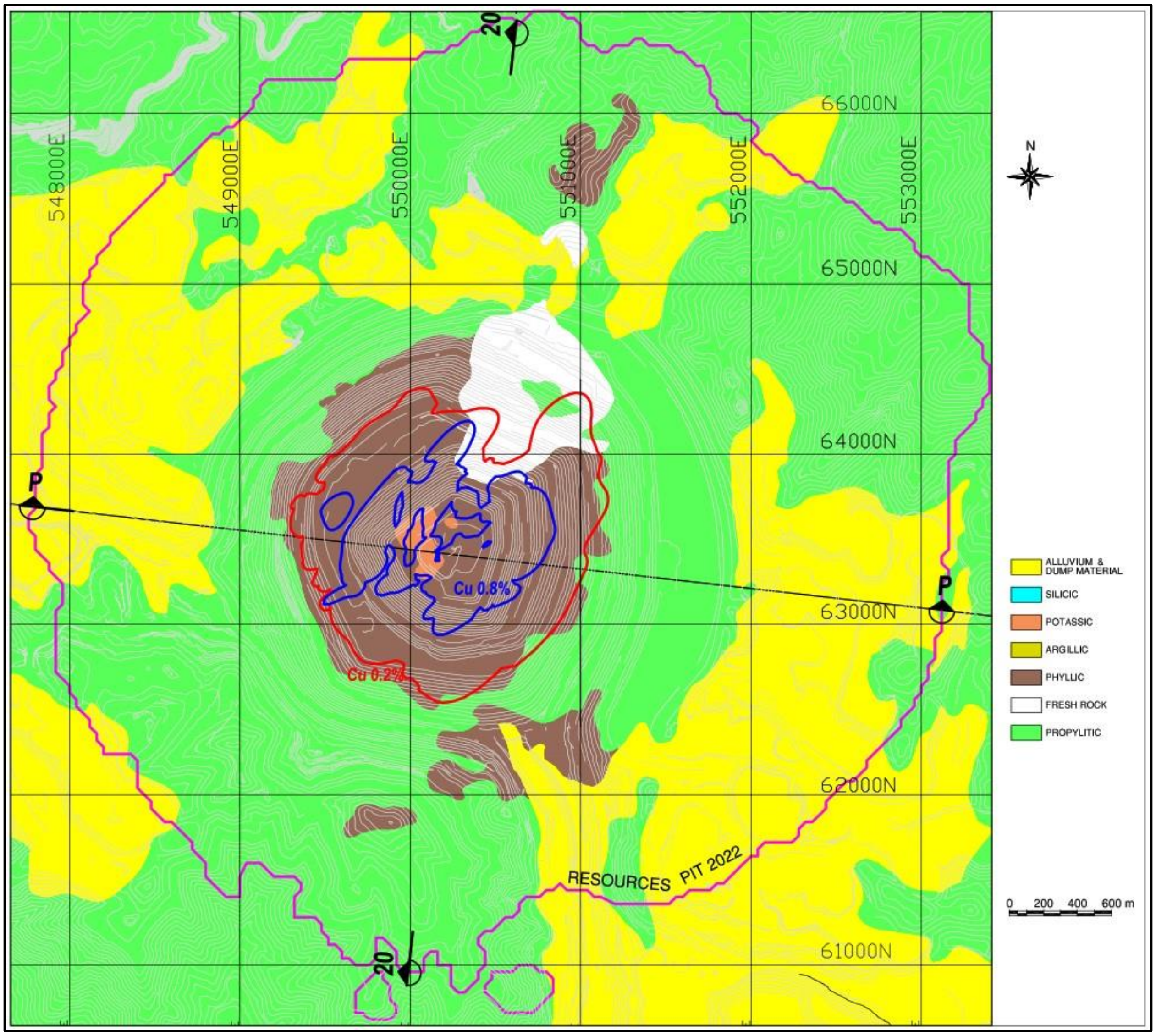
A 5–6 km diameter zone of hydrothermal alteration was recognized. The intensity of hydrothermal alteration varies from the center of the deposit towards the periphery, with four zones identified (Figure 6-7 to Figure 6-9):

- A small quartz–biotite–K-feldspar ± sericite–chlorite–albite–anhydrite central (potassic) zone 400 m wide with chalcopyrite and chalcocite as the dominant copper-bearing minerals, molybdenite, and pyrite (FeS_2) uneconomic iron ore. Potassic alteration occurred in the nucleus of the system, progressing to a phyllic alteration in the periphery. Type "B" and "D" veinlets developed within the potassic zone and are associated with the hypogenic sulfides responsible for fixing copper in the system.
- A quartz–sericite–pyrite (phyllic) envelope at the periphery of the deposit of 700 m. The presence of hydrothermal gypsum is a guide for the low-grade copper and molybdenum mineralization.
- A chlorite–epidote–calcite–pyrite (propylitized) zone extending more than 2 km.
- A remnant argillic zone located to the north of the deposit.

A supergene quartz–kaolin–chlorite and clay (argillic) alteration zone occurs in the weathered portion of the deposit.

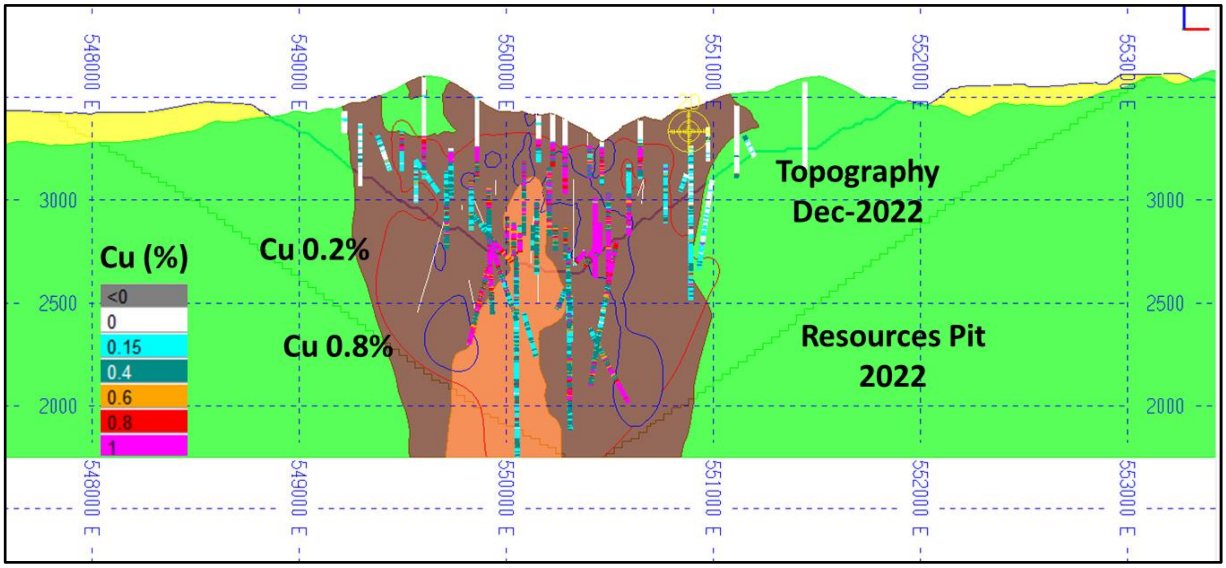
The primary alteration type in the breccia zones is silicification, together with sericite and small amounts of clay minerals. On the breccia edges, propylitic alteration is more typical.

Figure 6-7: Alteration Type Map



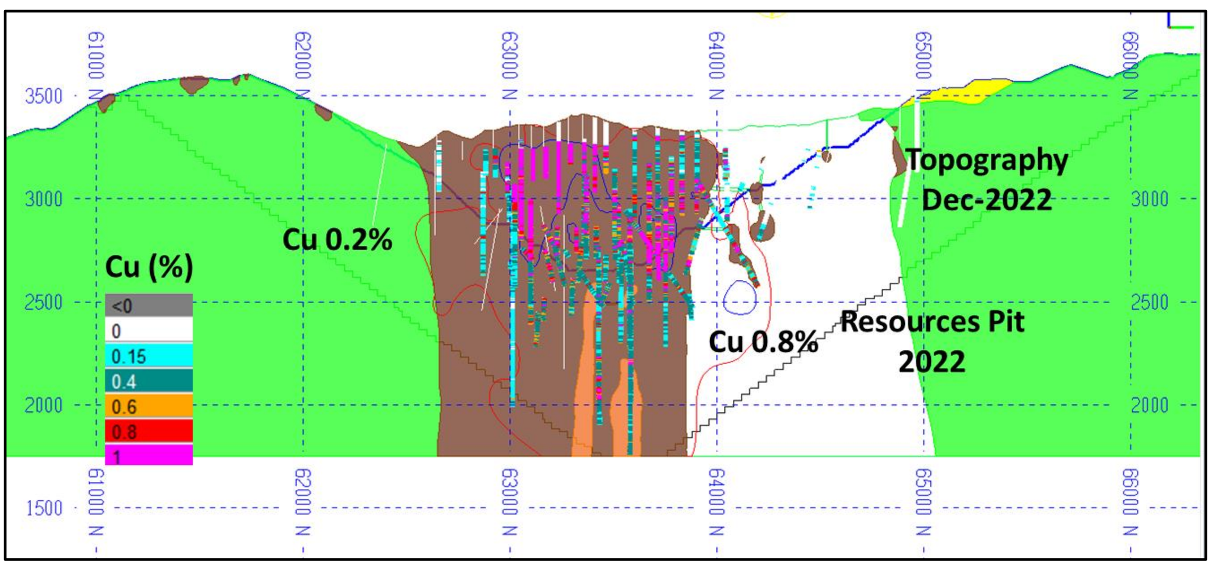
(Source: Wood, 2022)

Figure 6-8: Alteration Type Cross Section P



(Source: Wood, 2022). West–east section P, looking north. Legend key provided in Figure 6-4

Figure 6-9: Alteration Type Cross Section 20



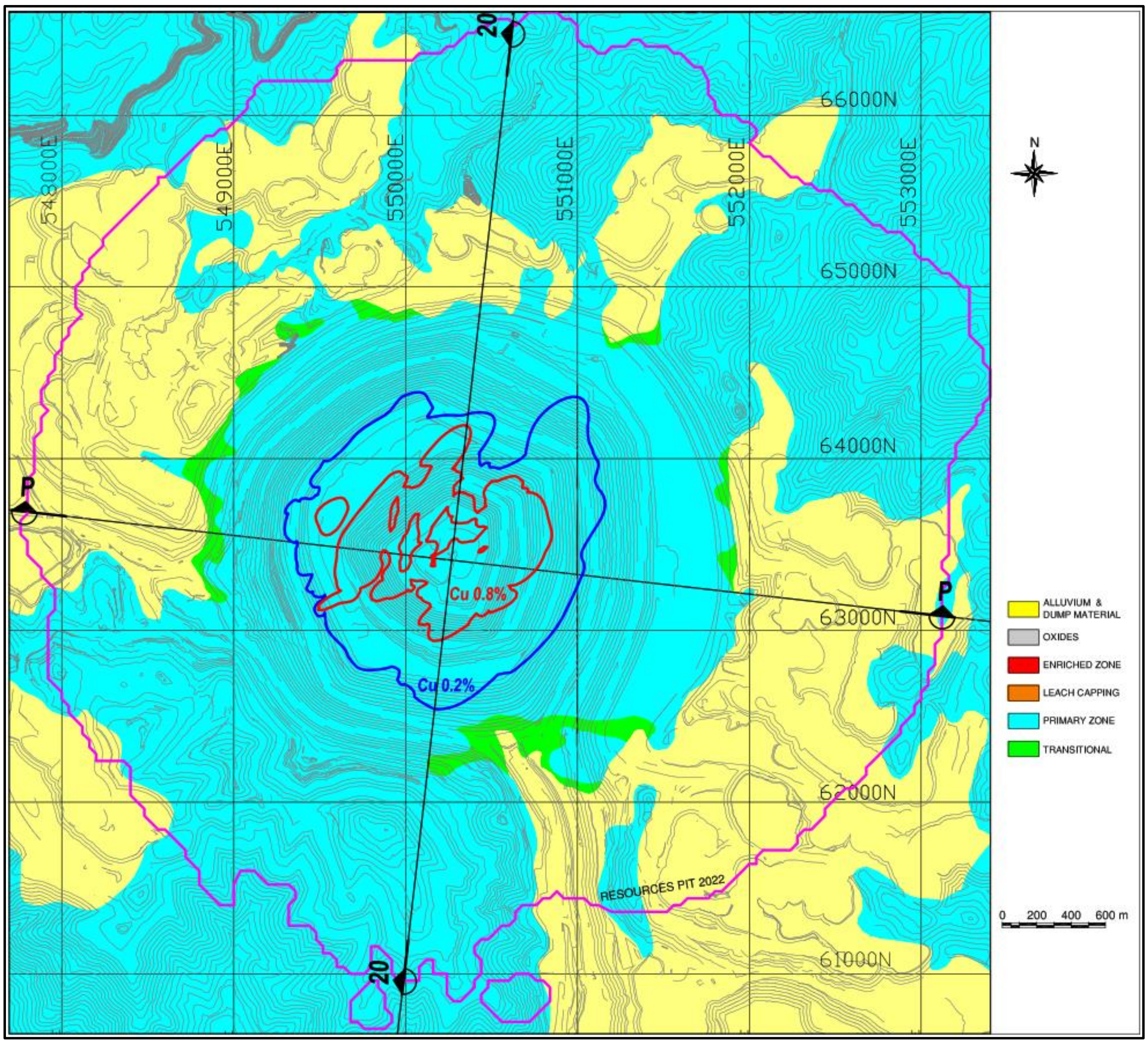
(Source: Wood, 2022). South-West–North-east section 20, looking west. Legend key provided in Figure 6-4

6.4.1 Mineralization

6.4.1.1 Mineralization Types

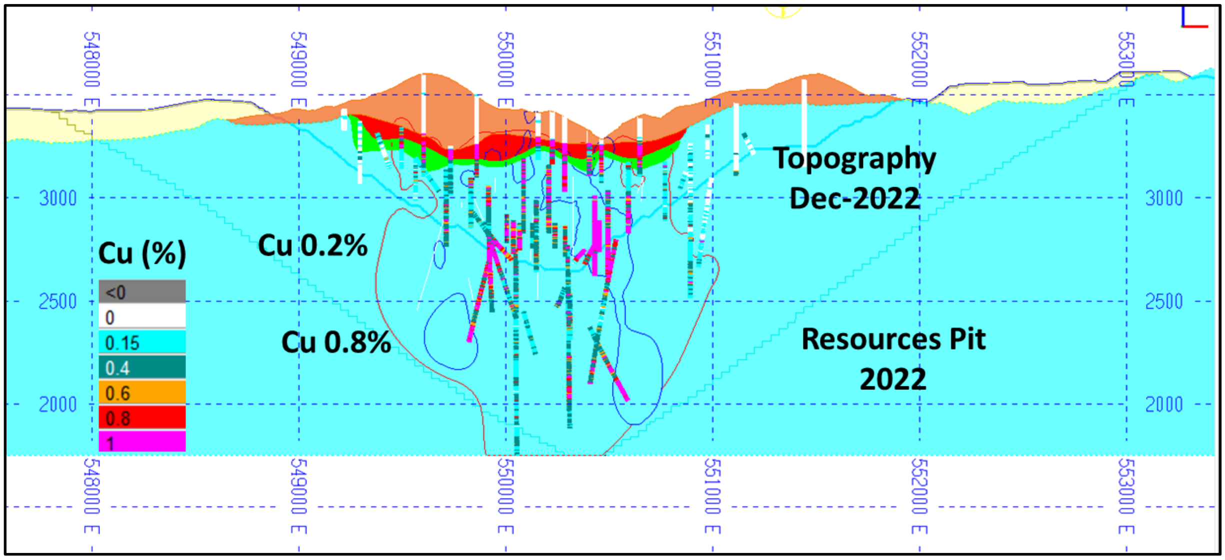
Mineralization consisted of leached capping, oxide, enriched, transitional and primary mineralization (Figure 6-10 to Figure 6-12). The first three types have largely been mined out.

Figure 6-10: Mineralization Type Map



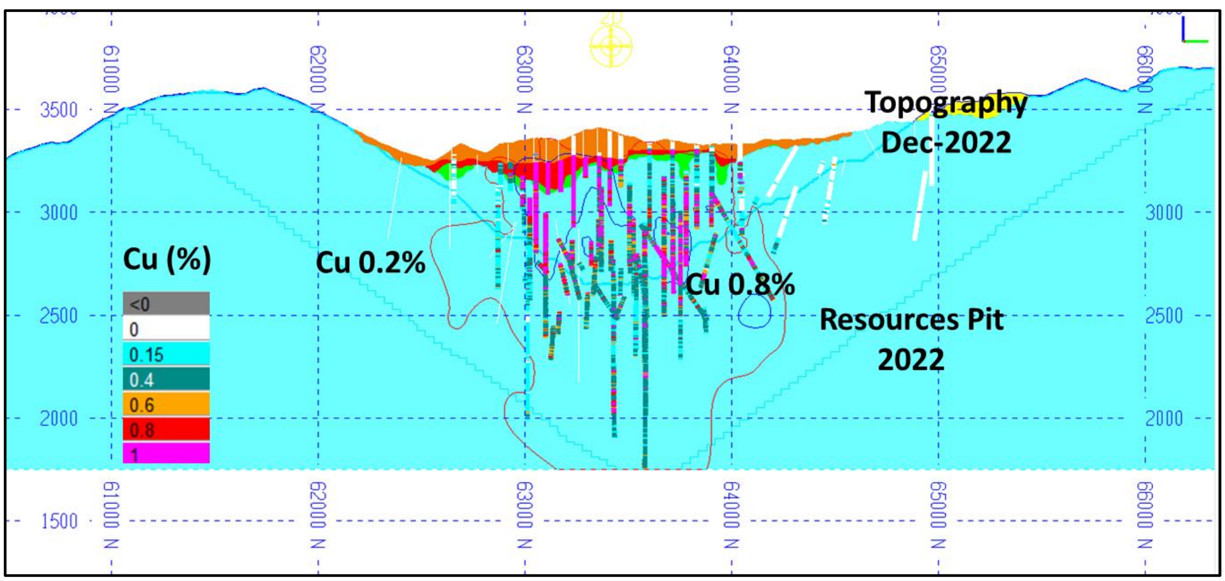
(Source: Wood, 2022)

Figure 6-11: Mineralization Type Cross-Section P



(Source: Wood, 2022). Legend key provided in Figure 6-4

Figure 6-12: Mineralization Type Cross-Section 20



(Source: Wood, 2022). Southwest–northeast section 20, looking west. Legend key provided in Figure 6-4

Mineralization types included:

- Leached capping was predominantly limonite (jarosite 30%, hematite 60% and goethite 10%) mostly disseminated and in fractures. It is mostly mined out; however, remnants occur around the periphery of the pit.
- Oxide mineralization was very sparse and may be entirely mined out.
- Enriched mineralization consisted of 90% chalcocite, and 10% digenite, covellite, and bornite in breccia matrix, disseminations, and veinlets. This material had the highest copper grades and is mostly mined out.
- Transition mineralization was about 60% chalcopyrite, 25% chalcocite and 15% molybdenite and bornite as breccia matrix, disseminations, and veins associated with quartz. It is mostly mined out, but remnants are localized on the west edge of the pit.
- Primary copper mineralization occurs as hypogene sulfides mainly restricted to the dacite porphyry and breccias. Chalcopyrite is the dominant economic mineral (90% of mineralization) with 10% bornite, molybdenite, and enargite as disseminations fracture fillings, and breccia matrix. It is associated with potassic alteration (biotite and/or K-feldspar) with about 1% of pyrite (pyrite to chalcopyrite ratio of about 3:1) associated with magnetite and anhydrite. Economic molybdenite mineralization is associated with quartz veinlets and locally, with disseminated chalcopyrite.

In the phyllic zone, pyrite is present as 10% of the rock. The pyrite to chalcopyrite ratio is about 12:1, associated with minor molybdenite, bornite, chalcocite, sphalerite, and galena.

6.4.1.2 Paragenesis

Mineralization and alteration are related to four hydrothermal events, known as the "Early", "Tourmaline", "Main", and "Late" stages.

The Early stage (characterized by potassic and sodic alteration and by chalcopyrite–pyrite stockwork mineralization), represented about 5% of the deposit's copper, and largely followed the first (T) dacite porphyry intrusive event, but came before the Main and L/R intrusions. The latter two intrusions are essentially barren, but are the most extensively exposed of the dacite porphyries in the pit.

A voluminous sulfide barren tourmaline breccia pipe with scarce tourmaline–quartz veins represented the tourmaline stage, and was emplaced after the Main and L/R dacite porphyries. The tourmaline breccias comprise quartz–sericite-altered clasts in a tourmaline–quartz matrix.

The tourmaline breccias were subsequently re-opened and the wall rocks fractured by the Main stage hydrothermal fluids to essentially emplace all of the molybdenite and most of the chalcopyrite mineralization. This resulted in the development of typically 3 mm wide quartz-rich veins that followed continuous fractures and had no well-defined alteration envelopes.

Chalcopyrite–pyrite veins, fracture coatings and fracture-controlled disseminations were also formed. Fragments of rock in the mineralized breccia matrix were intensely altered to sericite with tourmaline that occurred in veinlets and as cavity fillings by tourmaline. Gangue consists of quartz and gypsum. Veinlets are locally filled by quartz crystals jointly with scaly aggregates of sericite; these at the same time are cut by veinlets of a later hydrothermal event that resulted in pyrite weakly replacing chalcopyrite. Bornite occurs in <40 µm pyrite voids and as a replacement of chalcopyrite. In turn, bornite is locally replaced by tennantite and covellite. Molybdenite occurred as <200 µm anhedral crystals located in the matrix interstices or pores, and contained inclusions of rutile and chalcopyrite.

Between 54–52 Ma the dacite porphyry was emplaced and added sulfide mineralization as well as anhydrite. This medium-grained intrusive introduced rutile characterized by aggregates of anhedral crystals filling cavities in quartz, plagioclase, and gypsum gangue and as encrustations on chalcopyrite. Pyrite occurred as subhedral cubic crystals <260 µm, with edges replaced by chalcopyrite. Laminar molybdenite was deposited in the gangue and included in the chalcopyrite with <40 µm molybdenite grain sizes. Chalcopyrite as anhedral aggregates occurred in microfractures together with anhydrite and gypsum and replaced pyrite from its edges and in smaller proportion as disseminations. Tennantite was present in <30 µm pores in chalcopyrite.

The dacite agglomerate and latite porphyry, which are not cut by the main stage veining, were emplaced following the formation of the main hypogene mineralization, but were coeval with the extensive late stage, copper-poor, quartz–sericite–pyrite–andalusite alteration and more localized advanced argillic development. This intrusive phase was also responsible for large-scale phreatomagmatic eruptions that produced a 300 m diameter pebble breccia pipe and a swarm of pebble dikes.

7.0 EXPLORATION

7.1 Exploration

7.1.1 Grids and Surveys

The topographic survey used for the present mineral resource estimate includes field surveys completed as of July 28, 2022 with a projection of mining advance to the end of December 2022. Survey data were acquired by the mine survey department using a grid of local coordinates based on the UTM Zone 19K coordinate system, WGS 84 datum.

The topographic survey is in the local Toquepala mine grid coordinate system.

7.1.2 Geological Mapping

Geological mapping is undertaken to refine understanding of the lithological contacts encountered in the pit with the lithologies outside the final pit outline. Pit face mapping is conducted at 1:2,000 scale.

7.1.3 Geochemistry

No geochemical exploration has been conducted since the mine started operations.

7.1.4 Geophysics

No geophysical surveys for exploration purposes have been conducted since the mine started operations.

Geophysical surveys have been performed in support of geotechnical designs. Seismic refraction surveys were conducted by third-party consultants Arce Geofísicos and SGA Geofísica EIRL in 2011 and 2018 respectively. The surveys focused on defining peak particle velocities in the pit structural domains. Surveys consisted of ionic trajectory tomography, seismic refraction, and multichannel analysis of surface waves technologies.

7.1.5 Qualified Person's Interpretation of the Exploration Information

The Toquepala mine has been operating since 1960, and all exploration data generated prior to mine start-up is long superseded by mining and drill data.

7.1.6 Exploration Potential

Exploration potential is recognized at the Cerro Azul prospect, which is located 2 km northeast of the Toquepala open pit. The prospect is anomalous in copper and molybdenum and is associated with brecciation. The superimposed anomalies are about 1.4 x 0.8 km in area, with average values of 100–300 ppm Cu and 20–700 ppm Mo.

A geological map of the prospect is provided in Figure 7-1.

7.2 Drilling

7.2.1 Overview

Drilling totals 1,347 core and RC holes (486,548 m), and is summarized in Table 7-1. Drilling that supports mineral resource estimation consists of 1,037 core holes (377,592.06 m) as summarized in Table 7-2.

No data has been yet collected from the drilling executed in 2022. Assays are expected to be carried out in 2023.

Drill collar locations up to 2020 are shown on a Project-basis in Figure 7-2. Collars of those drill holes used in mineral resource estimation are shown in Figure 7-3.

RC, geotechnical, and blasthole data do not support mineral resource estimation.

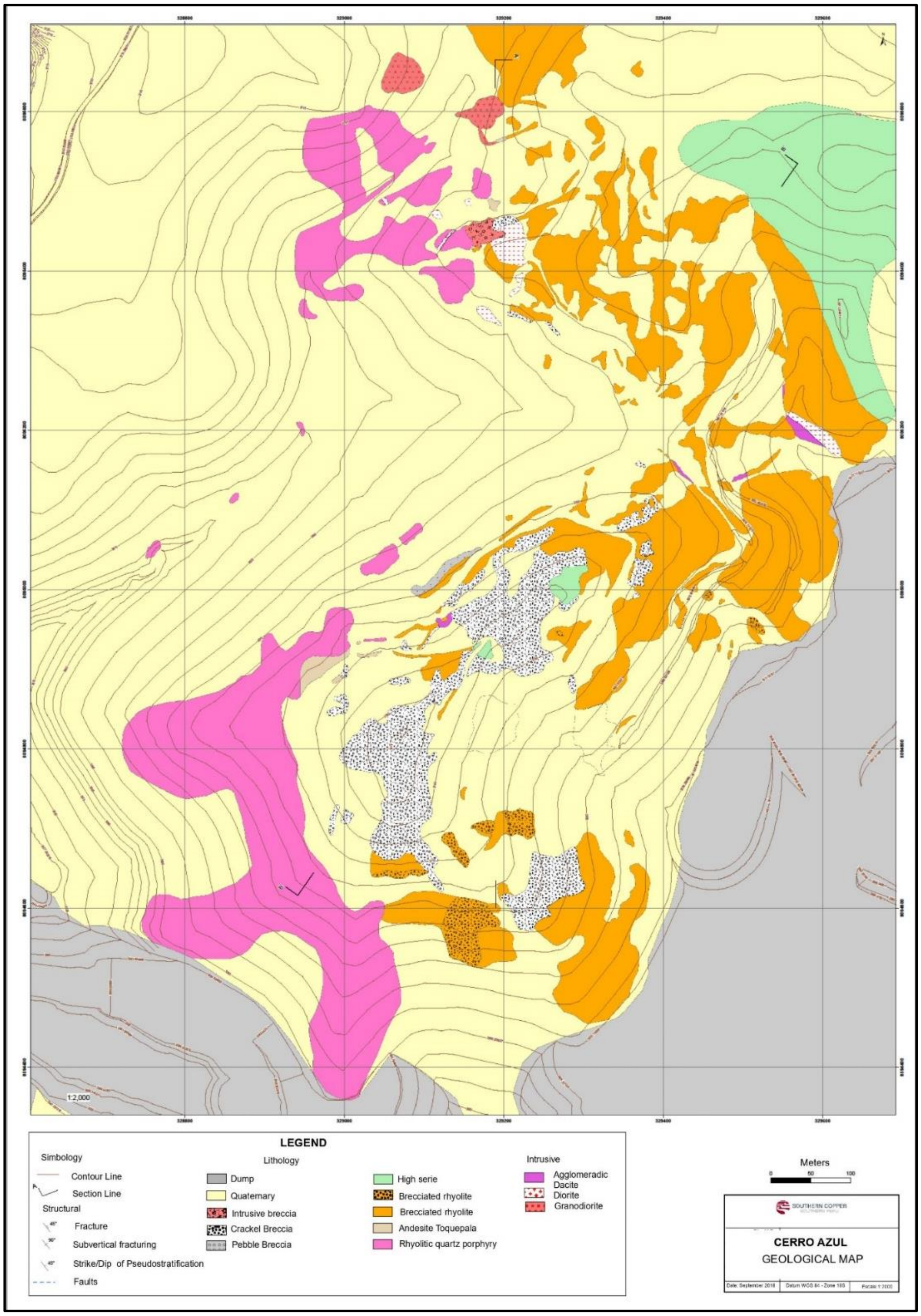
7.2.2 Drill Methods

Approximately 92% of the data in the database is core drilling and 8% is RC.

Holes are generally drilled vertically and collared on section lines spaced 60 m apart.

A total of 260 drill holes were inclined holes, which represent 26% of total drill holes used in estimation; the remaining drilling was vertical.

Figure 7-1: Cerro Azul Geological Map



(Source: Southern Copper, 2021)

Table 7-1: Project Drill Summary Table

		Geological		RC		Geotechnical		Total	
Year	Operator	No. of Drill Holes	Metres Drilled	No. of Drill Holes	Metres Drilled	No. of Drill Holes	Metres Drilled	No. of Drill Holes	Metres Drilled
1940	Cerro de Pasco	8	1,856.20	-	-	-	-	**8**	**1,856.20**
1941		14	2,968.09	-	-	-	-	**14**	**2,968.09**
1942		14	2,976.87	-	-	-	-	**14**	**2,976.87**
1949	Northern Peru	7	1,840.58	-	-	-	-	**7**	**1,840.58**
1950		39	11,832.87	-	-	-	-	**39**	**11,832.87**
1951		89	26,856.55	-	-	-	-	**89**	**26,856.55**
1952		3	579.15	-	-	-	-	**3**	**579.15**
1962	Southern Copper	6	1,295.41	-	-	-	-	**6**	**1,295.41**
1963		9	906.77	-	-	-	-	**9**	**906.77**
1965		3	1,278.64	-	-	-	-	**3**	**1,278.64**
1966		9	2,178.20	-	-	-	-	**9**	**2,178.20**
1967		5	1,446.58	-	-	-	-	**5**	**1,446.58**
1968		7	487.37	-	-	-	-	**7**	**487.37**
1969		14	2,283.25	-	-	-	-	**14**	**2,283.25**
1970		3	1,118.31	-	-	-	-	**3**	**1,118.31**
1973		1	394.72	-	-	-	-	**1**	**394.72**
1974		6	2,100.39	-	-	-	-	**6**	**2,100.39**
1975		6	2,375.32	-	-	-	-	**6**	**2,375.32**
1976		15	2,700.20	-	-	-	-	**15**	**2,700.20**
1977		27	6,721.25	-	-	-	-	**27**	**6,721.25**
1978		22	6,971.72	-	-	-	-	**22**	**6,971.72**

Year	Operator	Geological		RC		Geotechnical		Total	
		No. of Drill Holes	Metres Drilled	No. of Drill Holes	Metres Drilled	No. of Drill Holes	Metres Drilled	No. of Drill Holes	Metres Drilled
1979	Southern Copper	18	7,142.37	-	-	-	-	**18**	**7,142.37**
1980		3	1,497.18	-	-	-	-	**3**	**1,497.18**
1981		11	1,954.10	-	-	-	-	**11**	**1,954.10**
1982		9	2,506.83	-	-	-	-	**9**	**2,506.83**
1983		1	316.29	-	-	-	-	**1**	**316.29**
1985		5	763.34	-	-	-	-	**5**	**763.34**
1986		7	639.46	-	-	-	-	**7**	**639.46**
1987		3	156.06	-	-	-	-	**3**	**156.06**
1993		40	13,528.02	-	-	-	-	**40**	**13,528.02**
1994		32	10,113.09	-	-	-	-	**32**	**10,113.09**
1995		24	10,137.36	8	2,136	-	-	**32**	**12,273.36**
1996		65	29,816.37	34	9,394	-	-	**99**	**39,210.37**
1997		35	8,339.90	-	-	-	-	**35**	**8,339.90**
1998		18	7,634.08	-	-	-	-	**18**	**7,634.08**
1999		87	41,046.47	32	10,690	-	-	**119**	**51,736.41**
2000		29	15,279.59	-	-	-	-	**29**	**15,279.59**
2001		23	8,995.53	12	3,739	-	-	**35**	**12,734.53**
2002		3	676.71	-	-	-	-	**3**	**676.71**
2003		2	497.98	-	-	-	-	**2**	**497.98**
2005		8	709.34	-	-	-	-	**8**	**709.34**
2006		33	4,800.32	-	-	-	-	**33**	**4,800.32**
2007		40	6,241.28	-	-	-	-	**40**	**6,241.28**
2008		22	4,531.50	-	-	-	-	**22**	**4,531.50**

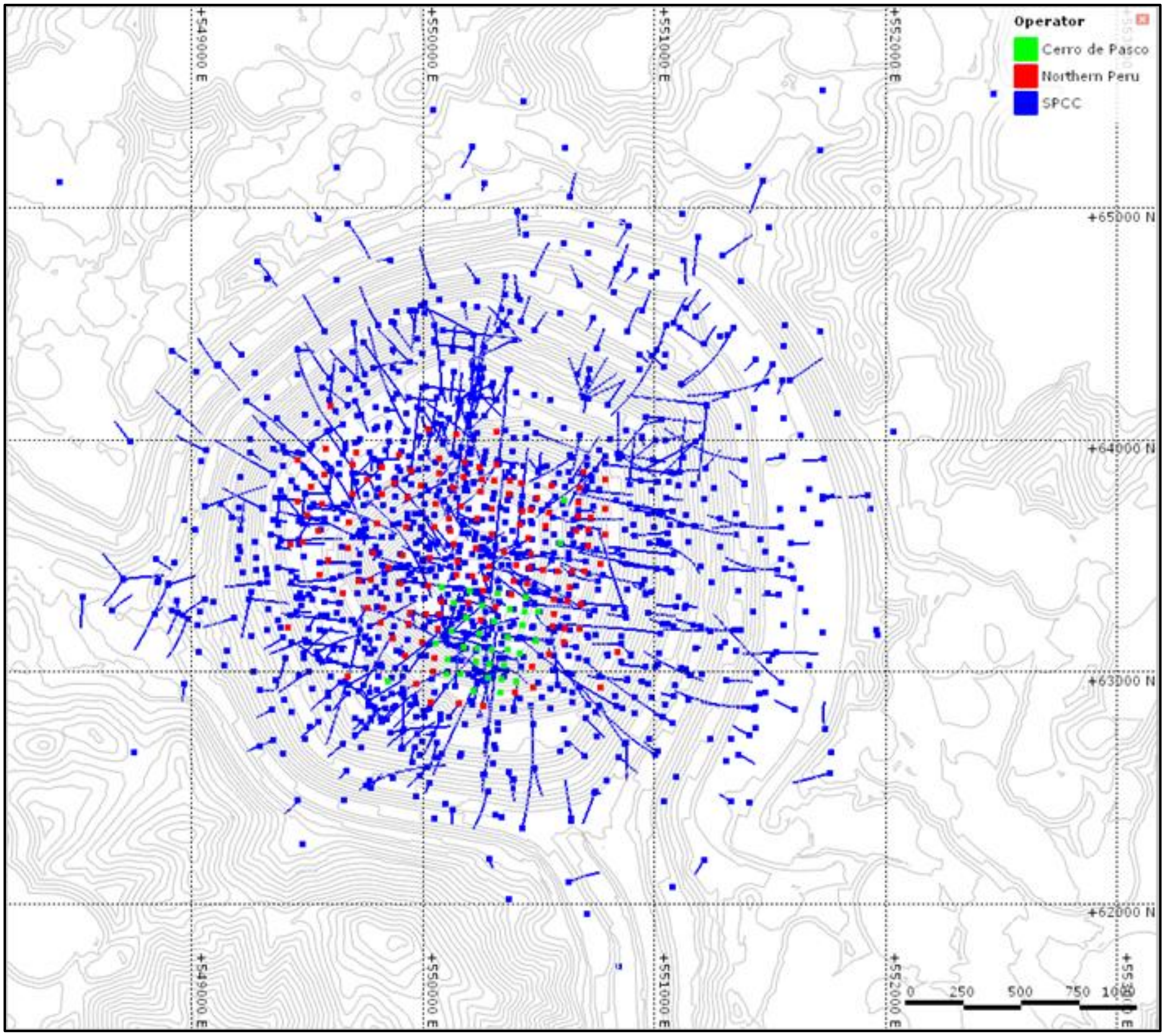
		Geological		RC		Geotechnical		Total	
Year	Operator	No. of Drill Holes	Metres Drilled	No. of Drill Holes	Metres Drilled	No. of Drill Holes	Metres Drilled	No. of Drill Holes	Metres Drilled
2009	Southern Copper	27	14,694.42	-	-	-	-	**27**	**14,694.42**
2010		36	11,737.93	-	-	-	-	**36**	**11,737.93**
2011		7	3,860.00	-	-	-	-	**7**	**3,860.00**
2012		6	2,550.20	-	-	-	-	**6**	**2,550.20**
2013		8	3,799.95	-	-	-	-	**8**	**3,799.95**
2014		16	6,047.35	-	-	-	-	**16**	**6,047.35**
2015		2	1,030.00	-	-	-	-	**2**	**1,030.00**
2016		35	18,855.90	-	-	12	3,619.85	**47**	**22,475.75**
2017		29	20,686.55	-	-	11	4,496.25	**40**	**25,182.80**
2018		116	28,531.15	-	-	17	6,158.40	**133**	**34,689.55**
2019		32	25,627.00	-	-	15	8,099.15	**47**	**33,726.15**
2020		20	15,555.00	-	-	4	1,878.10	**24**	**17,433.10**
2021		11	9,643.90	-	-	2	1,000.00	**13**	**10,643.90**
2022		26	12,026.40	-	-	4	2,200.00	**30**	**14,226.40**
Total		**1,196**	**433,137.36**	**86**	**25,958.94**	**65**	**27,451.75**	**1,347**	**486,548.05**

Table 7-2: Drill Summary Table Supporting Mineral Resource Estimates

		Geological	
Year	**Operator**	**No. of Drill Holes**	**Metres Drilled**
1940	Cerro de Pasco	8	1,856.20
1941		14	2,968.09
1942		14	2,976.87
1949	Northern Peru	7	1,840.58
1950		39	11,832.87
1951		89	26,856.55
1952		3	579.15
1962	Southern Copper	6	1,295.41
1963		9	906.77
1965		3	1,278.64
1966		9	2,178.20
1967		5	1,446.58
1968		7	487.37
1969		14	2,283.25
1970		3	1,118.31
1973		1	394.72
1974		6	2,100.39
1975		6	2,375.32
1976		15	2,700.20
1977		27	6,721.25
1978		22	6,971.72
1979		18	7,142.37
1980		3	1,497.18
1981		11	1,954.10
1982		9	2,506.83
1983		1	316.29
1985		5	763.34
1986		7	639.46
1987		3	156.06
1993		40	13,528.02
1994		32	10,113.09
1995		24	10,137.36
1996		65	29,816.37
1997		35	8,339.90

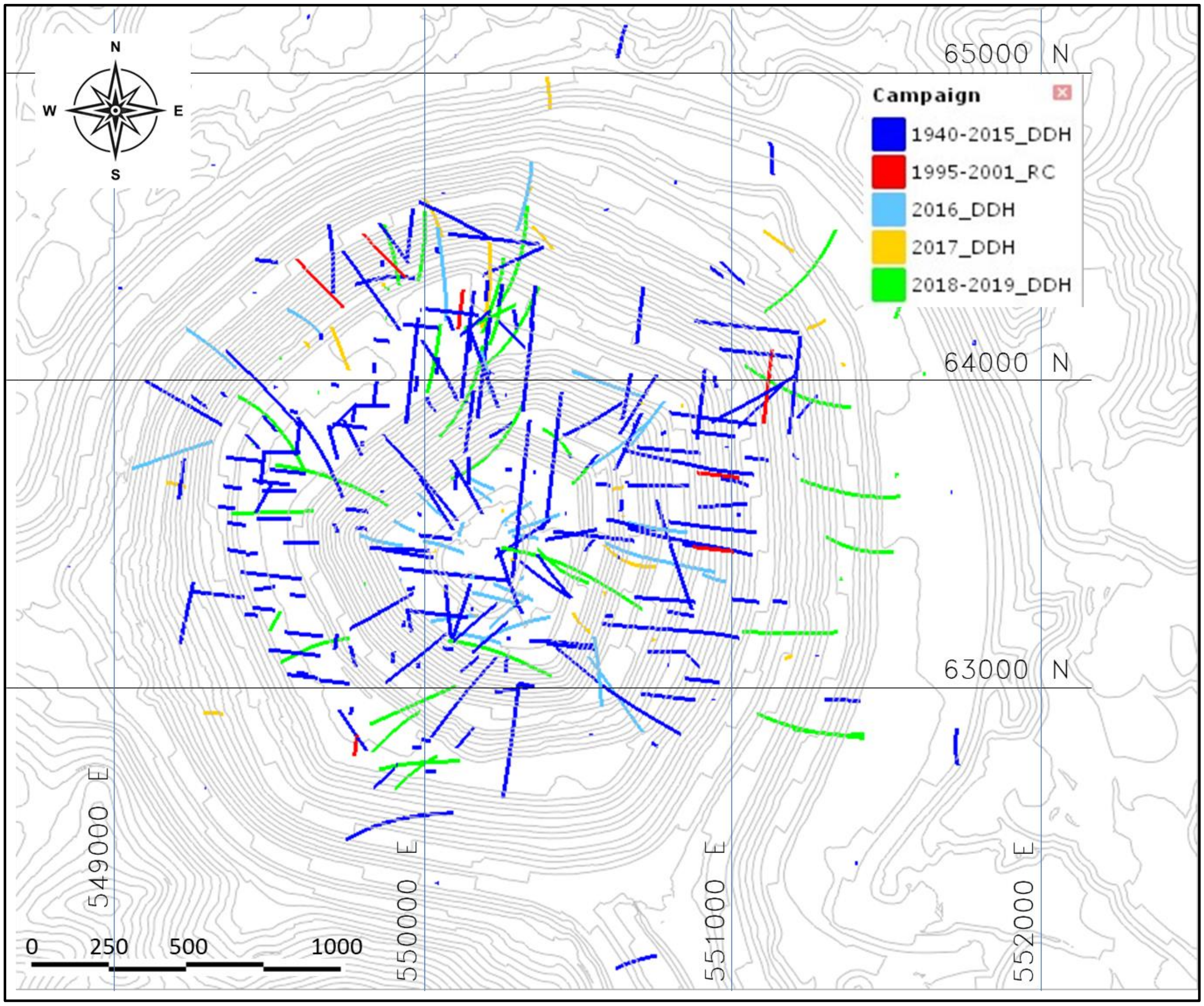
Year	Operator	Geological	
		No. of Drill Holes	Metres Drilled
1998	Southern Copper	18	7,634.08
1999		87	41,046.47
2000		29	15,279.59
2001		23	8,995.53
2002		3	676.71
2003		2	497.98
2005		8	709.34
2006		33	4,800.32
2007		40	6,241.28
2008		22	4,531.50
2009		27	14,694.42
2010		36	11,737.93
2011		7	3,860.00
2012		6	2,550.20
2013		8	3,799.95
2014		16	6,047.35
2015		2	1,030.00
2016		35	18,855.90
2017		29	20,686.55
2018		16	11,359.35
2019		30	24,478.80
Total		**1,037**	**377,592.06**

Figure 7-2: Property Drill Collar Location Plan



(Source: Wood, 2021)

Figure 7-3: Drill Collar Location Plan for Drilling Supporting Mineral Resource Estimates



(Source: Wood, 2021)

7.2.3 Logging

Core boxes are transferred from the drill platform to the core shack by technical services personnel. Since 2019, core has been photographed, and photographs are taken of wet core.

Historically, geological data were recorded on paper log forms; however, since mid-2018, logging data have been entered directly into a tablet PC through acQuire data entry. Logging currently uses pre-set geological codes.

Logging consists of collection of:

- *Structural data*: fracture intensity, fracture fill, presence of faults, tectonic breccias, core angles, rock quality data (RQD)
- *Geological data*: lithology, alteration, mineralization, mineralogy, degree of weathering
- Recovery.

7.2.4 Recovery

Core recoveries were reported by Southern Copper to be generally good.

Wood reviewed drill core recovery data for 75 drill holes completed during 2017–2019 that were recorded in the database. Histogram and probability plots show 99% of the drill intervals achieved over 90% core recovery for those drill holes reviewed.

7.2.5 Collar Surveys

Collar surveys for the 2001–2019 drill campaign were performed by mine surveyors using differential GPS equipment (GNS8). No formal survey certificate was produced so survey data in the database cannot be verified against original documents.

The collar survey method for the earlier campaigns is not known, and there are no original hard copy data to verify the collar locations in the database.

Collar surveys are in the local Toquepala mine grid system based on the UTM Zone 19 coordinate system.

7.2.6 Down Hole Surveys

Downhole surveys were not systematically performed during pre-2009 drill campaigns.

The survey data includes a total of 5,166 records for 1,037 drill holes, 772 drill holes are vertical (-90°≥dip≥-85°) and of these 742 are used in resource estimation. From the 994 drill holes used in estimation, 150 (15%) were surveyed using Flexit/Maxibor instruments, and 844 (85%) do not have a survey reference. From the 844 drill holes identified as "HISTORIC", 114 drill holes have more than one survey register.

Gyroscopic downhole surveys were completed for 25% of the holes in the mineral resource database. Approximately 27% of the holes >100 m deep were surveyed and only 5% of holes in the mineral resource database <100 m deep have downhole surveys. About 91% of holes in the 2016–2019 campaigns have downhole surveys.

The lack of downhole survey in older drill holes is a potential source of error in the location of deeper drill hole intersections.

7.2.7 Comment on Material Results and Interpretation

The term "true thickness" is not generally applicable to porphyry-style deposits as the entire rock mass is potentially mineralized and there is often no preferred orientation to the mineralization. In areas that display porphyry-style mineralization, in general, most drill holes intersect mineralized zones at an angle, and the drill hole intercept widths reported for those drill holes are typically greater than the true widths of the mineralization at the drill intercept point.

Drilling and surveying were conducted in accordance with industry standard practices at the time the drill data were collected and provide suitable coverage of the mineralization. The collar and downhole survey methods used provide reliable sample locations. Logging procedures provide consistency in descriptions.

The interpretation of the drilling results is summarized in representative drill section sections illustrated in Figures 6-5, 6-6, 6-8, 6-9. 6-11 and 6-12.

In Wood's opinion, the quantity and quality of existing drilling data are sufficient for resource estimation.

Factors that may impact the accuracy and reliability of drill results, such as sample location and sample recovery, have been adequately addressed.

7.3 Hydrogeology

7.3.1 Sampling Methods and Laboratory Determinations

The operations have a total of 152 hydraulic measurements available, collected in the period 1999–2018. Work was conducted by Itasca Chile, an independent consultant. Tests performed included LeFranc and Lugeon packer, slug, and injection or extraction tests.

Laboratories used for the hydrological testwork included Anddes Laboratory (Anddes), which is independent of Southern Copper, and the non-independent mine laboratory. Both laboratories performed tests using American Society for Testing and Materials (ATSM) standards.

7.3.2 Water Balance

A water balance was developed for the operations, covering an area of about 10 x 11 km. The system is almost in equilibrium, based on the stability of the pit lake level, and limited variations in the water levels in piezometric readings taken within the pit, in the pit walls, and outside the pit limits. The assessment is based on:

$$Inputs - outputs = \pm \Delta S$$

where:

- ± ΔS is the storage variation
- inputs = recharge by precipitation infiltration, totaling 17 L/s
- outputs = evaporation (1 L/s) + filtrations and springs (4 L/s) + other (12 L/s), to total 17 L/s

7.3.3 Comment on Results

The test results were reviewed, and the following noted:

- The hydraulic conductivity values were low. There was no clear relationship between the test depth and permeability.
- Hydraulic conductivities were low, and indicated a low-permeability rock mass, with minimal aquifer potential (Itasca, 2018).

7.4 Geotechnical

Open pit slope geotechnical analysis and design is supported by data gathered from 2013–2015 geotechnical drilling, laboratory testing, and bench-scale structural mapping. The work was reviewed and summarized in a report by Itasca–Piteau (2017).

7.4.1 Sampling Methods and Laboratory Determinations

The field investigation for the open pit included two geotechnical core drilling campaigns (2013, 2015) and associated laboratory testing, as well as structural mapping.

Approximately 20% of the 2013 core holes were oriented using the Reflex ACT II core orientation tool, and bore hole televiewer surveys were performed on some or all of the 2013 core holes. Logging for both the 2013 and the 2015 drilling campaigns consisted of lithology, alteration, and presence of clay, as well as the parameters needed to determine the rock mass rating (Bieniawski, 1976) for each core run.

Testwork performed included unconfined compressive strength, Brazilian tensile, triaxial, and direct shear tests.

Laboratories used for the geotechnical testwork included SGS in Santiago, Chile, and Mécanica de Rocas, Ltda. In Calama, Chile. Both laboratories performed tests using ATSM standards.

7.4.2 Structural Mapping

Structural mapping at the Toquepala open pit was conducted in six mapping campaigns from 2012 through 2015 which consisted of pit wide traverses totaling >24 km in length (John Fedorowich Structural Geology Consulting, Inc., 2015). Data collected included structure orientations, true fault thicknesses, character of fault breccia, gouge and fracturing, shear sense, and field estimates of intact rock strength, joint roughness coefficient, and observed persistence. Mapping was performed using a Trimble R8 RTK digital global positioning system instrument to measure the exposed outlines of the major fault breccia zones.

From the mapping a set of 293 fault outcrop polygons for fault breccia zones exposed within the Toquepala mine was produced. This information was assembled in 3D, together with historical fault mapping and current fault traces.

7.4.3 Facilities

Field investigations for the waste rock storage facilities (WRSFs) included test pits, field density tests, grain-size distribution tests, seismic refraction lines, multichannel analyses of surface waves (MASW), and microtremor array measurement tests. Laboratory tests included grain-size distribution tests on waste rock and foundation materials, Atterberg limit tests on waste rock and foundation materials, point load tests on rock mass samples, flexible wall permeability test, and abrasion testing on waste rock. A seismic hazard assessment was conducted by ZER Geosystem in 2013. These data were used to design the existing WRSFs and provide support for closure planning.

Geotechnical field investigations for the heap leach facilities included test pits, field density tests, grain size distributions, and one bore hole. Laboratory tests included grain size distributions on waste rock, ore, and foundation materials, Atterberg limits on waste rock, ore, and foundation materials, point load test on the foundation rock mass, standard proctor compaction tests on waste rock, undrained consolidated triaxial tests, flexible wall permeability tests, and abrasion tests on waste rock. These data were used to design the existing leach facilities and provide support for closure planning.

Geotechnical investigations supporting the design of the Quebrada Honda tailings storage facility (TSF) were performed by Woodward-Clyde (1994), Klohn Crippen (2002), AMEC (2006), Arcadis (2010), Southern Copper (2010), Arcadis (2013), and Itasca (2019). These tests included test pits, bore holes, MASW profiles, refraction microtremor profiles, and road-cut geotechnical mapping. Laboratory investigations on the foundation materials included grain size distribution tests, Atterberg limit tests, specific gravity tests, unit weight tests, direct shear tests, and undrained consolidated triaxial tests, along with characterization of tailings materials. These data were used to design the existing TSF, plan for future facilities, and provide support for closure planning.

7.4.4 Comment on Results

Lithologic and geomechanical logging protocols, and laboratory test equipment used, and quality assurance/quality control (QA/QC) checks on the logging and laboratory tests were not available for review by Wood.

Based on the 2017 Itasca–Piteau report:

- There is no information available as to any QA/QC procedures that may have been in place during data collection
- An independent review committee is tasked with preparation of testwork protocols and selection of the laboratories where the tests were performed
- No procedures and protocols for mine design are currently in place
- No geotechnical risk register or seismic management plan is mentioned.

Wood's review of summaries of field investigation and laboratory testing data presented in Itasca–Piteau (2017) indicate that the information used to support the Itasca–Piteau (2017) design of the open pit slopes appears to be consistent with generally-accepted industry standard practice for the level of geotechnical effort required to support pre-feasibility level open pit designs (Read & Stacey, 2010).

8.0 SAMPLE PREPARATION, ANALYSES, AND SECURITY

8.1 Sampling Methods

Core samples are taken at 3 m intervals from the top of the drill hole. Samples are halved using a core splitter, with half sent to the laboratory and half retained in the core box as a record. In areas of soft or friable rock, a spatula is used to collect the sample.

Samples are placed into pre-labelled bags that are subsequently closed using a security seal.

Whole core has been used at times for metallurgical determinations and bulk density testing.

8.2 Sample Security Methods

Sample security from drill point to laboratory relied upon the fact that samples were either always attended to, or stored in a secure area prior to shipment to the external laboratory. Chain-of-custody procedures consisted of completing sample submittal forms to be sent to the laboratory with sample shipments to ensure that all samples were received by the laboratory.

8.3 Density Determinations

The database contains 41,108 density determinations performed by Southern Copper personnel using the water immersion method from 661 drill holes with 484 drill holes from the 1973–2019 campaigns.

Wood reviewed a quality control report on the density data that consisted of external measurements by Certimin, an independent laboratory. Results show a reasonable correlation between the Certimin data and the Toquepala mine laboratory results, with a bias of -1.9%. Density reports for pre-2019 campaigns were not available.

8.4 Analytical and Test Laboratories

Laboratories used over the Project history include:

- Certimin SA (Certimin), sample preparation is located in Arequipa and sample analysis is located in Lima: initially used in 2016 for both sample preparation and analysis. Subsequently used from 2018 to date as the sample preparation laboratory, and 2017 to date as the external umpire laboratory. Certimin is independent of Southern Copper; accreditations: ISO 9001, ISO 14001 and ISO 45001.

- SGS del Perú SAC: used for sample preparation in 2017 is located in Arequipa; independent of Southern Copper; accreditations: ISO 9001, ISO 14001, ISO 17025 and ISO 37001.
- Inspectorate Services Perú SAC: used for analysis in 2017 is located in Arequipa; independent of Southern Copper; accreditations: ISO 9001, ISO 14001 AND ISO 17025.
- Ilo smelter laboratory: used for sample analysis from 2017 to date; not independent; not accredited.

8.5 Sample Preparation

No information was provided to Wood as to the sample preparation methods used at the Ilo smelter laboratory.

Certimin protocols in 2016 consisted of drying, crushing to 90% passing a -1/4 inch screen, followed by a second crushing stage to 90% passing 10 mesh (2 mm), and pulverizing to 85% passing -200 mesh. The later Certimin sample preparation protocol consisted of drying, crushing to 6 mm, followed by a second crushing stage to 90% passing -10 mesh, and pulverizing to 95% passing -140 mesh.

SGS protocols consisted of drying, crushing to 6 mm, followed by a second crushing stage to 90% passing -10 mesh, and pulverizing to 95% passing -140 mesh.

8.6 Analysis

Historical data for copper and molybdenum were determined by aqua regia digestion with an atomic absorption (AA) finish. These samples were analyzed at the Toquepala mine laboratory.

Samples in 2016 were prepared and analyzed at Certimin for copper by AAS following a four acid digestion and inductively-coupled plasma (ICP) optical emission spectroscopy (OES) for other elements.

Samples in 2017 were prepared by SGS using a two acid digest. Samples were analyzed by multispectral (20 elements) determinations, either at the internal Ilo laboratory or Inspectorate.

Since 2018 assaying has been performed at the internal Ilo laboratory. The samples were prepared by Certimin using a digestion and analyzed with an ICP-mass spectrometry (MS) finish. Total copper analyses were performed on samples with >1% Cu using AA. Sequential copper analyses were also conducted, as were carbonate assays.

8.7 Quality Assurance and Quality Control

8.7.1 1940–2015

No systematic quality control procedure was used to provide quality assurance for assaying prior to 2016.

There is a significant evolution in data acquisition and data quality control practices in the different drill campaigns in the Toquepala database. To gauge the potential impact of poorer quality data, and uncertainty about data quality Wood produced a nearest neighbor model for blocks below the end of year 2020 topographic surface and above a 0.3% Cu cut-off grade. Blocks from 2016–2019 with assay QA/QC represents the 51% of the total. Comparison of data from the 2016–2019 program with earlier data from prior programs resulted in the conclusion that the means of copper and molybdenum grades of adjacent intersections are comparable over tens of meters, and that analyses performed in the earlier drill campaigns are not significantly biased.

8.7.2 2016–present

The current assay quality control program for the Toquepala site includes the insertion of field duplicate, pulp duplicate, certified reference materials (standards), coarse blank, fine blank and check samples.

Sampling precision and analytical precision in Toquepala were evaluated using twin samples and pulp duplicates, respectively. Toquepala used the hyperbolic method to assess sampling and analytical precision (Simon, 2004). Max–min plots were constructed for copper and molybdenum. Precision level is considered as acceptable if the proportion of failures (failure rate) does not exceed 10% using as failure limit the $y^2=m^2x^2+b^2$ hyperbola evaluated for a 30% relative error. Failure rates from 2016–2019 indicate acceptable sampling and analytical precision.

Standards were used to assess accuracy and were prepared by Target Rocks Peru S.A.C. (Target Rocks). Most of the standards showed acceptable bias levels. Wood identified a few results outside the limits that are being investigated and monitored.

Preparation and analysis certificates for coarse and fine blanks samples were provided by Target Rocks. Coarse blank samples are calcareous material (12 mm particle size) and blank fine samples are siliceous sand. Blank analytical results do not show contamination for copper and molybdenum for drilling campaign from 2016–2019.

Southern Copper sent pulp samples from the 2017–2019 drill program to Certimin for check assays. Biases relative to the Ilo laboratory ranged from 1.2% to 4.9% for copper and from -5.0% to 1.0% for molybdenum, both of which are considered acceptable.

8.8 Database

The Toquepala database was migrated to the acQuire database platform in November 2011. The database stores both core and blasthole drill data.

Southern Copper states that the following protocols are in place:

- Assay data are uploaded directly into acQuire from the Ilo laboratory's OPUS software system.
- QA/QC data are reviewed to check if there are issues; if so, the batch is requested to be re-assayed.
- Density data are stored in an Excel spreadsheet.
- Survey data are uploaded directly into acQuire from digital reports (certificates).

Geological information from core drill is logged by geologists. Historically, these geological data were recorded on paper log forms; however, since mid-2018, logging data have been entered directly into a tablet PC through Acquire data entry. The files are loaded directly into the database. Geological data include information regarding lithology, structure, alteration, mineralization, mineralogy, supergene material. Logging utilizes pre-set geological codes

Data are regularly backed up.

Wood notes that the absence of original hard copy survey and assay certificates makes evaluation of database integrity difficult.

8.9 Qualified Person's Opinion on Sample Preparation, Security, and Analytical Procedures

In Wood QP's opinion, the sample preparation, security, and analytical procedures, and QA/QC protocols for the samples used in mineral resource estimation are acceptable for the purposes used.

9.0 DATA VERIFICATION

9.1 Data Verification by Qualified Person

9.1.1 Site Visit

Representatives from Wood visited the Toquepala Operations, as outlined in Chapter 2.4. Observations from the visit were incorporated into Wood's conclusions as appropriate to the discipline areas in this Report or incorporated into the recommendations in Chapter 23.

9.1.2 Database Audit

Wood requested documentation for 50 randomly-selected drill holes from Southern Copper, which represent 8% of the 600 drill holes that had mineralized intercepts below the December 2020 pit topographic surface.

A significant number of data were not available for the requested drill holes:

- *Survey*: none of the 50 drill holes had either collar or down hole survey records
- *Assay*: 43 drill holes had no assay records
- *Recovery*: 43 drill holes had no recovery or RQD records
- *Geology*: six drill holes had no logging records
- *Density*: 43 drill holes had no density records.

A high rate of unavailable documentation was observed, from 12% to 100%. Wood recommends that Southern Copper continue to attempt to locate and compile such documentation to be used during future audits and ensure that all future programs are properly documented.

In order to assess data integrity, Wood performed comparisons of the Toquepala dataset and its available original sources including collar, survey, density, assay certificates and reports; however, due to the lack of supporting documentation the data comparison was limited.

Systematic storage of supporting documentation is not part of the current procedures. Wood recommends that a document storage system be implemented, and all supporting documentation be properly stored.

Wood QPs compared 23,817 copper and molybdenum assay records against their respective assay certificates. No significant discrepancies were observed. The assay records compared were from 2016–2019 and represent 95% of the total records included in the database for these years. Assay records prior to 2016 were unable to be verified by Wood QPs because no documentation was available for those data.

Wood QPs compared 1,767 recovery records against their respective recovery certificates, which represent 9% of the total recovery records included in the database. A discrepancy for one record was observed, which represents an error rate of 0.1%, well below the maximum of 1% considered by Wood QPs to be an acceptable limit in data integrity review. Records from two drill holes were not included in the database; these omissions should be verified, confirmed, corrected, and documented by Southern Copper. Wood's recommendation is that Southern Copper verify all records from available recovery reports and include these in the Project database.

Wood QPs compared 298 logging records belonging to 38 drill holes against their respective log reports. Log reports for six drill holes were unreadable. Discrepancies for 24 records were observed, which represent an error rate of 8%. Some discrepancies could be related to subsequent re-logging; however, reasons for discrepancies should be verified and documented by Southern Copper. Wood QPs recommends verification of all records from available log reports, and inclusion of these verified data in the Project database.

Wood QPs compared 1,767 density records belonging to five drill holes against their respective density reports; these records represent 4% of the total recovery records included in the database. No discrepancies were observed. However, records from two drill holes were not included in the database. Wood QPs recommends verification of all records from available density reports, and inclusion of these verified data in the Project database.

9.1.3 Check Assay Program

Wood QPs selected 113 pulps from holes drilled from 1995–2019 and arranged for re-assay in the Certimin laboratory in Lima. Biases of the Certimin data relative to the Toquepala mine laboratory for copper and molybdenum ranged from -5.0% to 3.4%, which is within acceptable limits in the Wood QP's opinion.

9.1.4 Peer Review

Wood QPs requested that information, conclusions, and recommendations presented in the body of this Report be peer reviewed by Wood subject matter experts or experts retained by Wood in each discipline area as a further level of data verification.

Peer reviewers reviewed the information in the areas of their expertise as presented in this Report. This could include checks of numerical data, consistency of presentation of information between the different Report chapters, consistency of interpretation of the data between different discipline areas, checked for data omissions, verified that errors identified during Wood's gap analyses were appropriately addressed or mitigated, and reviewed the appropriateness of the individual QP's opinions, interpretations, recommendations, and conclusions as summarized by the QP Firm.

9.2 Qualified Person's Opinion on Data Adequacy

Wood QPs consider that a reasonable level of verification has been completed, and that no material issues would have been left unidentified from the programs undertaken.

Wood QPs are of the opinion that the data verification programs for Project data, in combination with mine operational data, adequately support the geological interpretations, the analytical and database quality, and therefore support the use of the data in mineral resource estimation, mineral reserve estimates, and the mine plans.

10.0 MINERAL PROCESSING AND METALLURGICAL TESTING

10.1 Introduction

Mining operations commenced in 1960, and the original samples supporting metallurgical testwork and process designs are long since mined out. However, additional metallurgical test programs have been conducted during mine operations.

10.2 Test Laboratories

Three different laboratories were used to perform metallurgical testwork to support the Project, of which one was an internal laboratory and two were external, Laboratorio Metalurgico Chapi in Lima (Chapi) and ThyssenKrupp Research Centre (ThyssenKrupp). The internal laboratory was not independent of Southern Copper. Chapi and ThyssenKrupp were independent of Southern Copper.

There is no international standard of accreditation provided for metallurgical testing laboratories or metallurgical testing techniques.

10.3 Metallurgical Testwork

A total of 66 composite samples from plant operations over a period of nine months were tested for hardness using the Bond ball mill work index (BWi) in the Chapi laboratory. Samples were also sent to ThyssenKrupp for high pressure grind roll (HPGR) testwork. This testwork and subsequent modeling indicate a throughput of 60 kt/d capacity in hard material (BWi of 17.9 kWh/t) and approximately 65 kt/d in normal material (BWi of 15 kWh/t).

A total of 133 samples from different mine zones were subjected to copper and molybdenum flotation testing by the internal metallurgical group at the Toquepala metallurgical laboratory during 2002.

10.4 Recovery Estimates

10.4.1 Leach Recoveries

The Toquepala deposit contains low-grade sulfides that are amenable to leaching. The ores are subjected to ferric bacterial leaching, copper is recovered to solution that is treated in a leach–solvent extraction (SX)–electrowinning (EW) (LESDE) plant to produce cathode copper. The Toquepala mine laboratory was used to perform the chemical assays of all leaching testwork samples. Six modules of crushed ore were prepared and tested under different conditions in a pilot plant from 2003–2005. Based on the test results, a recovery model for crushed ore was established as follows:

- %Rec CuT = (0.0755Ln(t) + 0.0793) x ISAC + (0.1845Ln(t) - 0.8476) x ISCN + (0.1233Ln(t) - 0.6927) x Ins)

where:

- CuT = total copper, ISAC = solubility index acid, ISCN = solubility index cyanide, Ins= insoluble

Subsequent to the above and considering the performance of the LESDE plant, the recovery model was revised and updated as follows:

- %Rec CuT = 0.58471 x ISAC + 0.49905 x ISCN + 0.1022 x Ins

where:

- CuT = total copper, ISAC = solubility index acid, ISCN = solubility index cyanide, Ins= insoluble

A large-scale test was completed in 2005, and involved run-of-mine (ROM) dump leach testing of three modules for at least 400 days. Based on the results, a recovery model for ROM was established as follows:

- % Rec. CuT = (0.1187Ln(t) - 0.3816) x ISAC + (0.1148Ln(t) - 0.5862) x ISCN + (0.0991Ln(t) - 0.5686) x Ins)

where:

- CuT = total copper, ISAC = solubility index acid, ISCN = solubility index cyanide, Ins= insoluble

The LOM expected copper recovery is estimated at 16.1% (excluding leach ore existing in leach dumps). The LOM leach copper recovery including leach ore existing in leach dumps is 8.0%.

10.4.2 Flotation Recoveries

The copper recovery model is based on flotation testwork carried out in 2002. A total of 133 representative samples of the following 15 years of plant production were prepared by and sent to the internal laboratory for rougher flotation testing. Analyses included copper, oxide copper (Cuox), acid soluble copper (ASCu), molybdenum and iron. A mineralogical study on the chalcopyrite and pyrite was completed.

A regression analysis on the most significant variables (%Cu, %Mo, %Fe and %Cpy) was completed to provide a predictive recovery equation. The equation that best fitted the copper recovery and remains currently in use is:

- % Cu Rec. = 91.7798 - 0.000102*TMSD + 6.71336*%Cu – 59.80729*%Cuox - 0.14877*(%Py/%Cpy)

The molybdenum recovery model was developed based on bench scale flotation testing carried out as part of the development plan in the period 2001–2002. Analysis of the testwork results indicated that the only significant variable affecting the molybdenum recovery is the grade of the molybdenum in the plant feed. The equation that best fitted the molybdenum recovery and remains currently in use is:

- % Mo Rec. = 8*ln (% Mo) + 89.97+ (0.75 - % Cu) *11 + (3.0 - % Fe) *2.4

The LOM expected copper recovery is estimated at 88.2% and molybdenum recovery is estimated at 68.1%. The forecast LOM copper concentrate grade is 25.52% and the molybdenum concentrate grade is forecast at 55.80%.

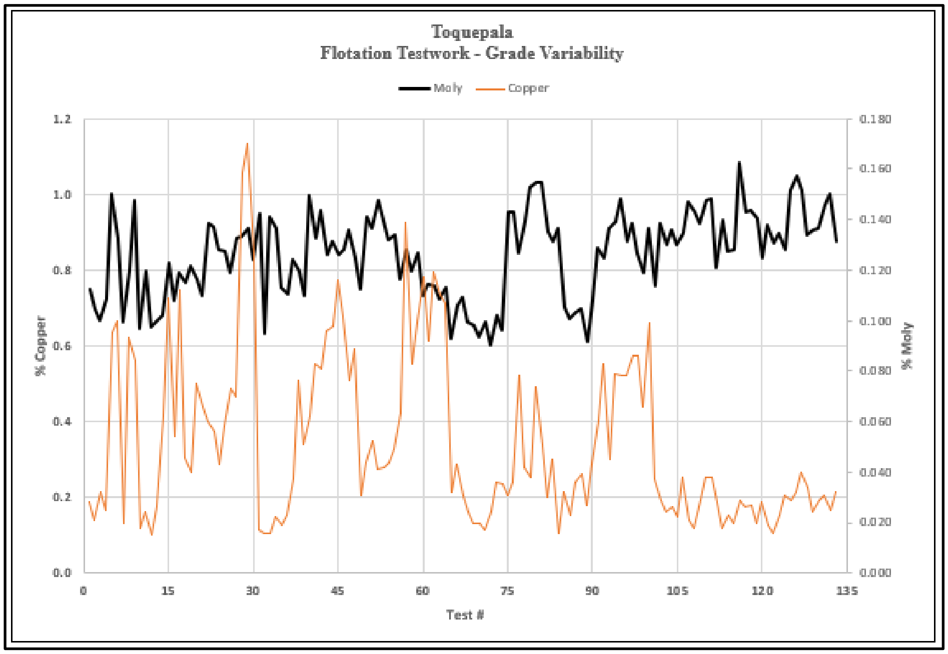
10.5 Metallurgical Variability

Samples tested in the 2002 program were selected based on a wide range of copper and molybdenum grades (Figure 10-1), and the mineralogical characteristics of the ore, expressed as ratio of main mineral types (Figure 10-2). This was used by Southern Copper to develop a model that covers the ore variability.

10.6 Deleterious Elements

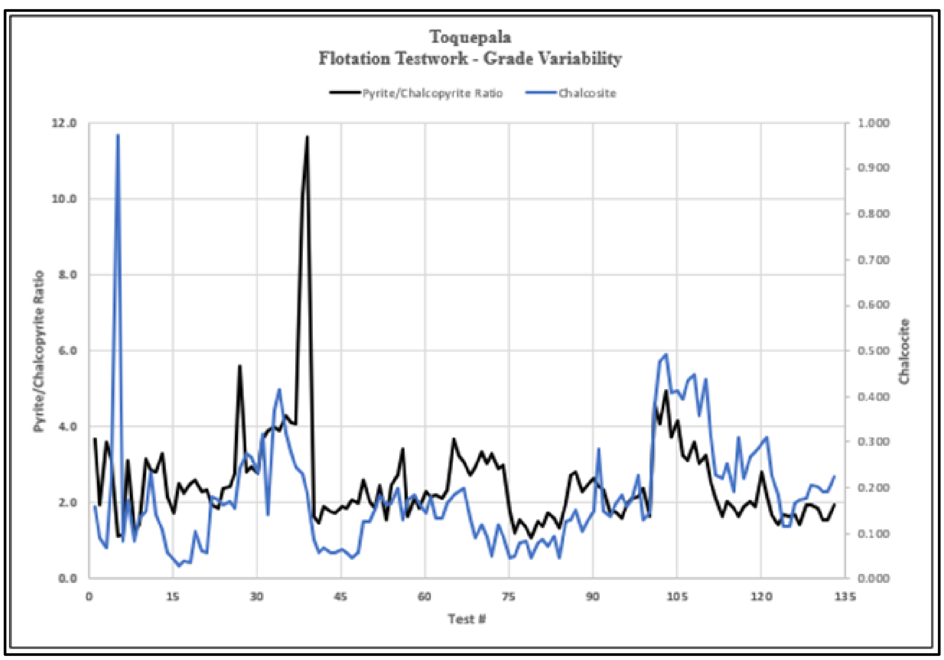
The copper and molybdenum concentrates produced are considered clean concentrates as they do not contain significant amounts of any deleterious elements.

Figure 10-1: Grade Variability in Flotation Test Samples



(Source: Southern Copper)

Figure 10-2: Flotation Test Pyrite: Chalcopyrite Ratio Variability



(Source: Southern Copper)

10.7 Qualified Person's Opinion on Data Adequacy

A significant amount of testwork was performed on the Toquepala sulfide ore at bench scale level, while the oxide ore was tested at pilot and industrial level. The testwork data have generated sufficient information to develop plant throughput estimates, copper and molybdenum recovery models for the sulfide ore, and a copper recovery model for the oxide ore. Furthermore, the developed models have been improved and updated over time to take into account the actual plant performance.

Testwork on the sulfide ore was performed on selected samples representing the first 15 years of plant production. The testing program included comminution and flotation testing for the sulfide ore. The selected sulfide samples cover a wide range of copper and molybdenum content as well as the mineralogical characteristics of the ore. Testwork on the oxide ore included pilot and industrial leaching pads.

The available metallurgical testwork information is considered by the qualified person to be of an acceptable quality to at least pre-feasibility level of study, and are considered adequate to support the metallurgical inputs to the mineral resources, mineral reserves, and the economic analysis.

The copper concentrate produced at both concentrators is considered to be a clean concentrate, and no penalties are expected as the concentrate does not contain any significant amounts of deleterious element.

11.0 MINERAL RESOURCE ESTIMATES

11.1 Introduction

Mineral resources were prepared by third-party consultants Hexagon, and reviewed, adjusted and endorsed by Wood qualified persons in accordance with definitions under S-K 1300.

11.2 Exploratory Data Analysis

Exploratory data analysis included review of histograms, probability, scatter, and contact plots. Findings included:

- Zones of higher-grade copper and molybdenum mineralization are not obviously bound by lithological units.
- Grade profiles across contacts and within lithological units are commonly gradational.
- There is poor correlation between the copper and molybdenum assays and copper and silver.
- Copper and molybdenum boundaries should generally be treated as hard during estimation.

Hexagon reviewed the copper assay data, separating the values into anomalous values (higher-grade) and lower-grade/background categories. The anomalous material was further split into three populations:

- ROCKV = 1. Total copper values are hosted by pre- and post-mineral lithologies and are characterized by intervals with significantly higher total copper grades with respect to adjacent intervals. These intervals can be explained by the presence of mineralized veinlets in pre-mineralizing lithologies or fragments of mineralization in post-mineralized lithologies.
- ROCKV = 2. Total copper values are hosted by pre-mineral lithologies displaying continuous intervals of mineralization.
- ROCKV = 3. Total copper values are hosted by mineralizing lithologies with higher total copper intervals in comparison to adjacent intervals. The population is characterised by intervals with high total copper grades followed by intervals of lower total copper grades, either as continuous or isolated intervals.

11.3 Geological Models

The lithological model consists of 15 lithologies, of which the major units within the resource model were the dacite porphyry, diorite and angular breccia lithologies. The ore type model has four ore types, with a fifth coded for fill. Six alteration types, as well as fill material, comprise the alteration model.

Wood inspected plans and sections, and compared the interpretations with the logging data, and concluded that the models respected the majority of logged lithology and ore type intervals. The alteration model was less refined than the lithology and ore type models and was not used directly in construction of estimation domains. Wood noted that there were issues with the volume or area of the upper potassic unit and the geometry of its contacts change significantly between sections.

Copper estimation domains were based on lithology above and below the primary sulfides, whereas the molybdenum estimation domains were based on lithology only.

11.4 Density Assignment

Specific gravity was assigned to the block model based on the lithology code. Specific gravity values were influenced by the proportion of gypsum present, and depending on lithology, ranged from 2.59–2.72 with no gypsum, to 2.66–2.76 with the presence of gypsum.

11.5 Grade Capping/Outlier Restrictions

No capping or outlier restriction was used by Hexagon during mineral resource estimation. Wood checked the model on section and in plan and found minor evidence of over-projection of high grades. For future estimates, Wood recommends that a capping study is completed, and outlier restriction is used to control grade estimation.

11.6 Composites

The assay data were composited on 3 m intervals, broken at lithology boundaries. Composite intervals <1.5 m at the bottoms of holes and lithological boundaries were appended to the previous composite interval during the compositing run. Un-sampled or un-assayed intervals were ignored.

11.7 Variography

Variography was completed in MineSight software on total copper and molybdenum grades for block grade estimation. Most directional variograms were modeled with two structures. An isotropic generic variogram of 200 m was used in domains with few samples.

11.8 Estimation/Interpolation Methods

A non-rotated block model was defined for the block grade estimate to provide high resolution at geological boundaries. Block dimensions were 20 x 20 x 15 m.

Ordinary kriging (OK) with a two-pass estimation approach was used for total copper and molybdenum block grade estimation. The total copper grade estimation was completed within each domain (combination of lithology and the area above and below the primary sulfides surface). The estimation plan was divided into four regions.

For blocks that were not estimated, an average value was assigned based on the domain the block fell within.

11.9 Validation

Model validation included visual and geostatistical methods:

- Inspection of composited grade samples and block grades on vertical sections showed that the total copper and molybdenum block model grades correlated well with the composite data.
- Summary statistics were tabulated for the OK grade and nearest-neighbour (NN) models. Wood considers a grade estimate to be unbiased if the OK estimate and NN mean grades are within ±5%; this was the case for the majority of the domains. Wood considered the global bias to be within acceptable limits.
- Local grade trends for copper and molybdenum by domain were evaluated with swath plots constructed for easting, northing, and elevation. Correspondence between copper and molybdenum OK and NN grade was generally good. However, where data density was low, some mismatches were observed. The copper OK estimates were globally unbiased with respect to the NN estimates grades. In some domains OK and NN grades were lower than the composite grades.
- A change of support selectivity check was completed for the above sulfide surface and the below sulfide surface copper domains. In general, the validation demonstrates reasonable

correlation between the distributions for the OK estimate and the adjusted NN distribution.

Wood performed a review of available reconciliation data based on the quarterly and annual variances from 2016–2020, and noted the following:

- From 2016 to end of year 2020, no significant bias was noted in the copper grade.
- From 2016 to end of year 2020, the resource model over-estimated the molybdenum grade by between 10% and 25%.
- The 2021 resource model over-estimates the copper grade above the 0.3% Cu cut-off grade and under-estimates the ore tonnage above the cut-off grade.

11.10 Confidence Classification of Mineral Resource Estimate

11.10.1 Mineral Resource Confidence Classification

Mineral resources were initially classified by Southern Copper based on a combination of the average distance to the nearest drill holes and the kriging variance (Table 11-1).

Wood reviewed the classification criteria using a distance to data algorithm. There was a significant portion of measured assigned to areas where the drill spacing was >100 m.

Wood concluded that the resource classification did not reflect the actual spatial configuration of the composites file used to estimate the copper grade, with the result that for about 30% of the blocks classified as measured and 98% of the blocks classified as indicated, the copper composite file used for grade estimation did not meet the average distance threshold set in the classification criteria. A number of higher-confidence classification blocks were assigned on the basis of a single drill hole and were clustered around that drill hole. The kriging variance and distance to the closest composite did not always properly represent the drill hole spacing.

Table 11-1: Confidence Classification

Confidence Classification	Distance to Nearest Drill Hole (m)	Number of Drill Holes	Kriging Variance
Measured	≤100	4	≤0.119
Indicated	>100 but ≤150	4	>0.119 ≤0.178
Inferred	Blocks not classified as measured or indicated		

11.10.2 Uncertainties Considered During Confidence Classification

Following the analysis that classified the mineral resource estimates into the measured, indicated, and inferred confidence categories, uncertainties regarding sampling and drilling methods, data processing and handling, geological modeling, and estimation were incorporated into the classifications assigned. Areas with the most uncertainty were assigned to the inferred category, and the areas with fewer uncertainties were classified as indicated. No mineral resources remained in the measured category.

11.11 Reasonable Prospects of Economic Extraction

11.11.1 Input Assumptions

Wood constrained the mineral resource estimate within a conceptual pit shell using a Lerchs-Grossmann algorithm and the parameters summarized in Table 11-2.

11.11.2 Commodity Price and Market

Long-term commodity prices used in resource estimation are based on Southern Copper's internal price forecast based on analyst and bank forecasts and are stated in Table 11-2. An explanation of the derivation of the commodity prices is provided in Chapter 16.5. The estimated timeframe used for the price forecasts is the 50-year LOM that supports the mineral reserve estimates.

The market for the mine production is discussed in Chapter 16.1.

11.11.3 Cut-off

The cut-off grade used for mineral resource estimation for sulfide material was 0.146% Cu. Low-grade sulfide material to be sent to the leach dumps was reported at a cut-off of 0.052 %Cu. The inputs to the cut-off grades are shown in Table 11-2. Operating costs were based on actual costs and data from Southern Copper's operating mines in Peru, Wood's experience and the proposed mine and process plans. Wood used slightly more optimistic assumptions on costs for mineral resources than those used for mineral reserves. Along with 15% higher long-term metal price assumptions for the mineral resource inputs the slightly more optimistic assumptions ensured the mineral reserves would be a sub-set of the mineral resources,

Wood considers those blocks within the constraining resource pit shell and above the cut-offs applied have reasonable prospects for economic extraction.

Table 11-2: Input Parameters, Mineral Resource

Parameter	Unit	Value
Price		
Copper	US$/lb	3.80
Molybdenum	US$/lb	11.50
Mining		
Reference mining cost*	US$/t	1.87
Incremental haulage cost up	US$/t	-
Incremental haulage cost down	US$/t	-
Processing		
Concentration process cost*	US$/t	7.68
Leaching process cost*	US$/t	0.70
Selling*		
Concentrate Cu payable price**	US$/lb	3.37
Concentrate Mo payable price***	US$/lb	9.72
Leach Cu payable price****	US$/lb	3.77
Other		
Leaching process factor	-	-
Minimum Modified Mining Royalty*****	% NSR	1
Average LOM recovery		
Concentrate	%	88.2
Leaching	%	16.1
Cut-offs		
Sulfide cut-off	% Cu	0.146
Leachable cut-off	% Cu	0.052
Pit slopes		
Pit slope angles	Variable inter-ramp, degree	40–50

Note: Numbers have been rounded.

* Excluding sustaining capital costs.

** Concentrate Cu payable price per pound produced includes the following: smelting & refining recoveries (99.4% and 99.9% respectively) and treatment costs (US$0.303/lb Cu, excluding sustaining costs), copper selling cost (US$-0.0024/lb Cu), and 1% NSR royalty

*** Concentrate Mo payable price per pound produced includes the following: molybdenum selling cost (US$1.679/lb Mo), and 1% NSR royalty.

**** Leach Cu payable price per pound produced includes the following: cathode ocean freight cost (US$0.032/lb Cu), copper cathode premium (US$0.041/lb Cu), and 1% NSR royalty.

***** As per current Peruvian mining taxation regime.

11.12 Mineral Resource Estimate

11.12.1 Mineral Resource Statement

Mineral resources are reported using the mineral resource definitions set out in S-K 1300, and are reported exclusive of those mineral resources converted to mineral reserves. The selected point of reference for the mineral resource estimate is in place (before mining). The indicated mineral resource estimates for the Toquepala Operations are provided in Table 11-3. The Inferred mineral resource estimates are included in Table 11-4. Wood is the QP Firm responsible for the estimate and the estimates have been prepared by, or under the supervision of qualified persons.

Table 11-3: Indicated Mineral Resource Statement

Process Type	Tonnage (Mt)	Cu (%)	Mo (%)	Contained Cu (Mlb)	Contained Mo (Mlb)
Sulfide	1,584.2	0.43	0.024	15,060.6	829.2
Leach (Low-grade sulfides)	521.2	0.09	-	1,024.8	-
Total	**2,105.4**	**0.35**	**-**	**16,085.4**	**829.2**

Table 11-4: Inferred Mineral Resource Statement

Process Type	Tonnage (Mt)	Cu (%)	Mo (%)	Contained Cu (Mlb)	Contained Mo (Mlb)
Sulfide	2,406.7	0.39	0.019	20,939.9	1,010.2
Leach (Low-grade sulfides)	2,306.0	0.08	-	4,158.9	-
Total	**4,712.7**	**0.24**	**-**	**25,098.8**	**1,010.2**

Note: (1) Mineral resources are reported in place and are current as at December 31, 2022. Mineral resources are reported exclusive of mineral reserves. Wood is the QP Firm responsible for the estimate.

(2) Mineral resources are reported within a conceptual pit shell that uses the following input parameters: metal prices of US$3.80/lb Cu and US$11.50/lb Mo; average metallurgical recovery of 88.2% for copper and 68.1% for molybdenum from a process plant and 16.1% copper recovery from a heap leach; base mining costs of US1.87/t; mill process operating costs of US$7.68/t, leach operating costs of US$0.70/t; copper concentrate payable price of US$3.37/lb Cu, molybdenum concentrate payable price of US$9.72/lb Mo, and leach copper payable price of US$ 3.77/lb Cu.

(3) No estimates for molybdenum are reported for leachable material as this element cannot currently be recovered using the leach process envisaged.

(4) Numbers in the table have been rounded. Totals may not sum due to rounding.

11.12.2 Uncertainties (Factors) That May Affect the Mineral Resource Estimate

Areas of uncertainty that may materially impact all of the mineral resource estimates include:

- Changes to long-term metal price and exchange rate assumptions
- Changes in local interpretations of mineralization geometry such as presence of unrecognized mineralization off-shoots; faults, dikes, and other structures; and continuity of mineralized zones
- Changes to geological and grade shape, and geological and grade continuity assumptions
- Changes to metallurgical recovery assumptions
- Changes to the input assumptions used to derive the open pit shell that is used to constrain the estimates
- Changes to the cut-off values applied to the estimates
- Variations in geotechnical (including seismicity), hydrogeological and mining assumptions
- Changes to environmental, permitting and social license assumptions.

11.12.3 QP Statement

Wood's QP is of the opinion that any issues that arise in relation to relevant technical and economic factors likely to influence the prospect of economic extraction can be resolved with further work. Porphyry-copper style deposits are a well-known and studied deposit type, and Southern Copper has more than 60 years of experience with mining the Toquepala deposit.

12.0 MINERAL RESERVE ESTIMATES

12.1 Introduction

Indicated mineral resources were converted to probable mineral reserves by applying the modifying factors within a prefeasibility level mining study of the current and planned Toquepala mining operations. The life of mine plan for the Toquepala mining operations is considered by the Wood QP to be technically achievable and economically viable and is a reasonable basis for determining the mineral reserves. Inferred mineral resources were set to waste.

12.2 Development of Mining Case

12.2.1 Pit Optimization

Pit optimization was performed using the Lerchs-Grossmann (LG) algorithm in GEOVIA Whittle software. A summary of the economic and operational parameters used for the pit optimization of the Toquepala deposit is presented in Table 12-1.

Nested pit shells were run from revenue factors (RF) ranging from 0.2 to 1.2 (Figure 12-1 and Figure 12-2). The revenue factor is a multiplier applied to the base metal price and, subsequently, used in the pit optimization. For example, a RF of 1.0 corresponds to a copper base price of US$3.30/lb. A revenue factor of 0.5 multiplies the base metal price by 0.5 to determine the price used in the optimization and pit shells.

For final pit selection Southern Copper's corporate guidelines dictates that total life-of-mine (LOM) production and metal content are maximized. As such, the revenue factor 1.0 pit shell was selected as the guide for the final pit design, and a cut-off strategy to define process destination was used in mine planning. Additionally, a factor of 60% was applied to the leach copper recovery with the purpose of considering the effectiveness of leaching based on operational experience for this process.

12.2.2 Block Model

The block model was updated to address recommendations made by Wood during the review for the 2021 year-end mineral reserve estimate, see discussions in Chapters 11.8 and 12.2.3. These modifications were reviewed and approved by Southern Copper prior to the pit optimization step.

Table 12-1: Input Parameters Mineral Reserve Pit Shell

Parameter	Unit	Value
Price		
Copper	US$/lb	3.30
Molybdenum	US$/lb	10.00
Mining		
Reference mining cost	US$/t-mined	2.46
Incremental haulage cost above reference level	US$/t-mined	0.012
Incremental haulage cost below reference level	US$/t-mined	0.018
Processing		
Concentration process cost	US$/t-processed	8.38
Leaching process cost	US$/t-processed	0.82
Selling		
Concentrate Cu payable price*	US$/lb-produced	2.81
Concentrate Mo payable price**	US$/lb-produced	8.24
Leach Cu payable price***	US$/lb-produced	3.28
Other		
Leaching process recovery factor****	-	0.6
Average LOM Cu recovery		
Concentrate	%	88.2
Leach material*****	%	16.6
Minimum Modified Mining Royalty******	% NSR	1

Note: Numbers have been rounded. All costs and metal prices assumptions are fixed over the 50-year life of mine.

* Concentrate Cu payable price per pound produced includes the following: smelting & refining recoveries (99.4% and 99.9% respectively) and treatment costs (US$0.382/lb Cu), copper selling cost (US$-0.0024/lb Cu), and 1% NSR royalty

** Concentrate Mo payable price per pound produced includes the following: molybdenum selling cost (US$1.679/lb Mo), and 1% NSR royalty.

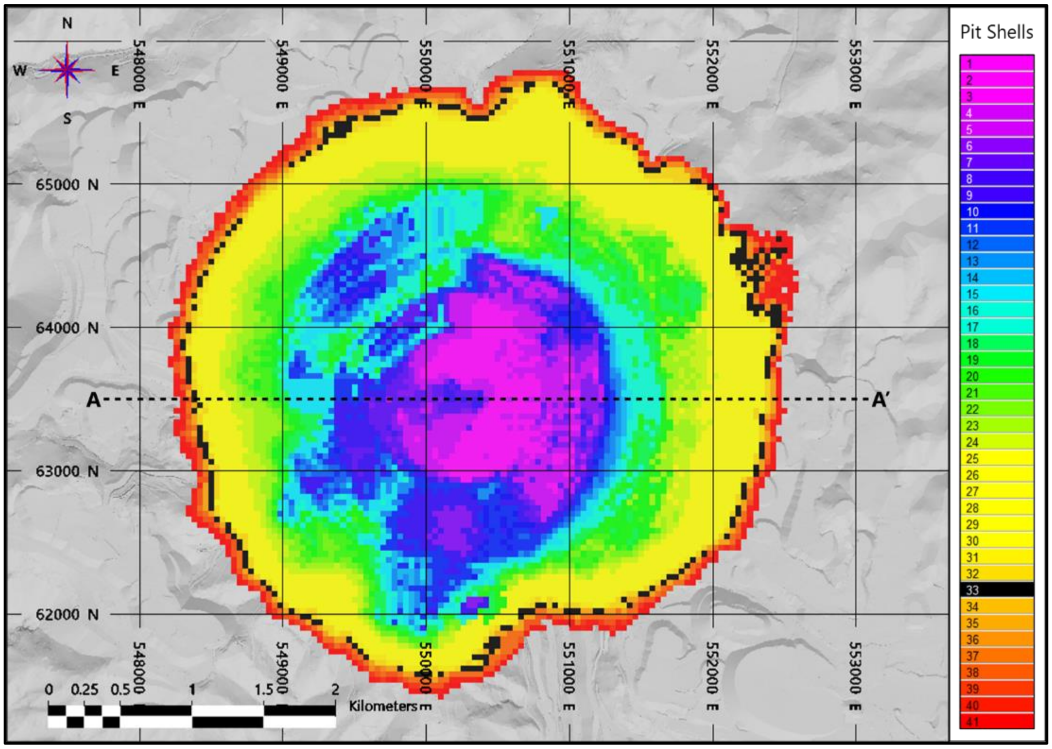
*** Leach Cu payable price per pound produced includes the following: cathode ocean freight cost (US$0.032/lb Cu), copper cathode premium (US$0.041/lb Cu), and 1% NSR royalty.

**** Only 60% of leachable material will be processed, see discussion in Chapter 12.2.6.

***** Excluding leach ore existing in leach dumps

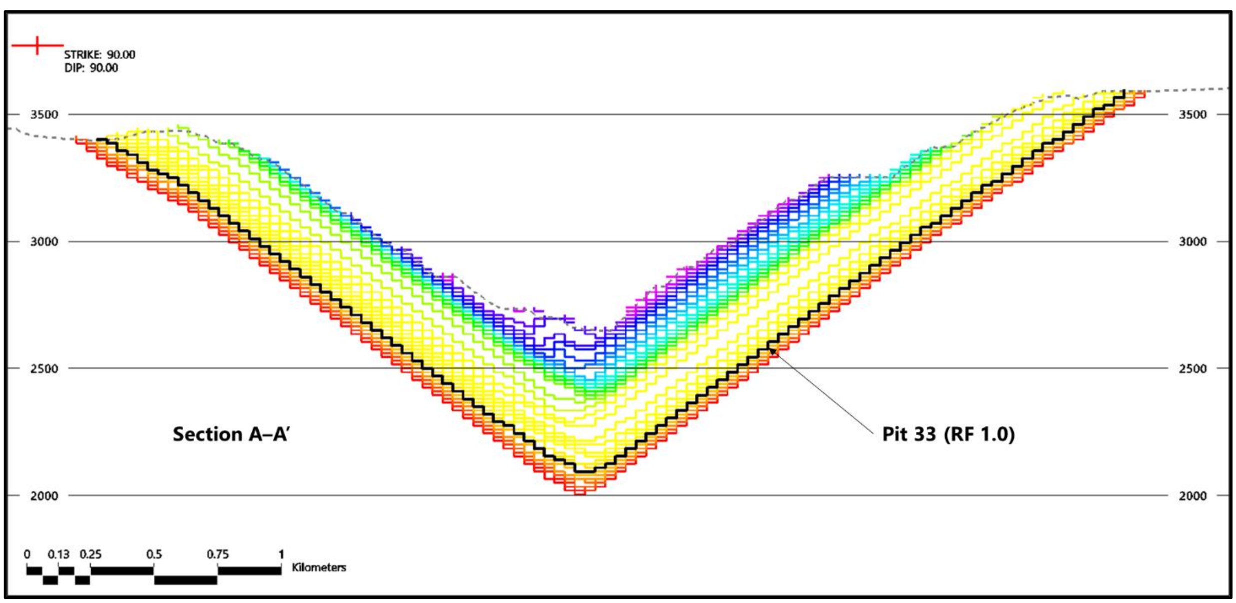
****** As per current Peruvian mining taxation regime

Figure 12-1: Nested Pit Shells from Pit Optimization (Plan View)



(Source: Wood, 2022)

Figure 12-2: Nested Pit Shells from Pit Optimization (Section View)



(Source: Wood, 2022)

12.2.3 Adjustment Factors – Based on Reconciliation Data

For the 2022 mineral reserve estimate, the 2021 mineral resource model was used, with the following adjustments applied:

- A 6% mining dilution for the ore blocks to correct the tonnage and reduce the copper grade.
- A downward correction factor of 22% applied to the molybdenum grades, based on the overestimation of the molybdenum metal content.
- A 100% mining recovery used because no reduction due to operational issues was identified.

12.2.4 Topography

Surface topography was provided by Southern Copper and corresponds to the forecasted topography to the end of 2022. This surface was used to code the rock percentage in the block model item TOPO. Blocks above the surface were given a value of 0, blocks below the surface were given a value of 100, and blocks on the surface were given a value between 0–100 based on percentage below topography.

12.2.5 Slope Angles

Geotechnical zones used for the pit optimization were based on guidance provided by Itasca (2016, 2017).

Block model item GTZN was used to code the different geotechnical zones and corresponds to an overall slope angle assigned in GEOVIA Whittle software. Overall slope angles (OSA) were estimated based on the 2021 reserve pit design (Table 12-2).

Table 12-2: Overall Slope Angle by Geotechnical Zones

Zone	GTZN Code	OSA (degree)
M	1	31.0
Fill	2	32.0
M, IV, VII	3	34.3
II	4	37.1
III	5	37.5
V	6	35.8
I, VI	7	37.0
Bottom	8	37.0

Note: OSA calculated based on the 2021 reserve pit design. Fill code was used for blocks with undefined GTZN code. Bottom zone (below level 2110 masl) is only applied for resource pit.

12.2.6 Metallurgical Recoveries

Copper metallurgical recoveries were included in the block model for mineral reserves classified as amenable to either concentration or to leaching processes, using formulas provided by SCC. The average copper recovery to the concentrate is 88.2% for the life of mine

The metallurgical recovery for molybdenum to the concentrate was included in the block model using a formula provided by SCC. The average molybdenum recovery is 68.1% for the life of mine

Metallurgical recoveries for copper leach material, based on metallurgical testwork is 16.6%. A leaching process factor of 0.6 was applied to this leaching copper recovery because only 60% of the leachable material will be effectively leached and processed by the SX/EW plant. This factor is based on reconciliation carried out by SCC, where it was determined that 40% of the material loaded on the leach dumps is not irrigated with acid due to a number of factors including material located in access areas, conveyor movement, leach material located at the boundaries of the dumps, among others.

The smelting recovery for copper was set at 97.4%, and the refining recovery was 99.9%. Both values represent the average smelting and refining recoveries at the Ilo smelter and refinery between 2018–2020.

12.2.7 Mining Costs

The base mining cost used was US$1.87/t mined, which was estimated from the 2021 year-end mineral reserve estimate LOM mining cost and the incremental haulage costs. The mining sustaining cost used was US$0.59/t-mined, and included mining equipment, mining infrastructure (truckshop expansion), waste dumps (land acquisition), and mining maintenance capital costs.

The pit reference level used for sulfide, leachable, and waste materials was 3,250 masl. An incremental haulage cost of US$0.012/t-mined was applied for each bench above the pit reference level and US$0.018/t-mined was applied for each bench below the pit reference level.

12.2.8 Processing Costs

The concentrator operating cost used was US$6.305/t-processed for concentrate material, and corresponds to the 2021 year-end mineral reserve estimate LOM average concentrator operating cost. The concentrator sustaining capital cost used was US$0.277/t-processed for material amenable to concentration, which included concentrators ongoing sustaining costs.

The tailings storage operating costs used was US$1.376/t-processed for material amenable to concentration, and corresponds to the 2021 year-end mineral reserve estimate LOM average conventional and filtered tailings disposal operating cost. The tailings sustaining cost used was US$0.426/t-processed by concentration, which included existing TSF, filtering tailings plant and supporting infrastructure, and waste dumps (land acquisition) capital costs.

The leaching and SX/EW operating cost used was US$0.698/t-processed for leach material, and corresponds to the 2021 year-end mineral reserve estimate LOM average Quebalix deposit, leach and SX/EW operating costs obtained. The leaching and SX/EW sustaining cost used was US$0.121/t-processed for leach material, which included primary crusher relocation, leaching and SX/EW ongoing sustaining costs.

The smelting and refining operating cost used was US$0.303/lb of copper cathode, and corresponds to the 2021 year-end mineral reserve estimate LOM average smelting and refining (Ilo) operating costs. The smelting and refining sustaining cost used was US$0.079/lb of copper cathode, which included Ilo smelter and refinery ongoing sustaining and maintenance, and other ongoing sustaining costs.

12.2.9 Treatment Charges for Concentration Process

The copper treatment charges included metallurgical deduction and allowance, ocean freight cost, and a copper cathode premium. The cathode premium reduced the selling cost, obtaining a final negative treatment charges of -US$0.0024/lb of copper cathode.

A treatment charges of US$1.679/lb produced was used for molybdenum, which included freight and roasting costs.

12.2.10 Transport and Treatment Charges for Leaching Process

An ocean freight cost of US$0.032/lb of copper cathode was assumed, which corresponds to the average cost from 2020 to August 2022, using normalized values to Q3-2022, of shipping the material to the Americas, Europe, and Asia.

A copper cathode premium of US$0.041/lb was applied, average from 2020 to August 2022, using normalized values to Q3-2022.

12.2.11 Royalties

A 1.0% NSR government royalty was applied for the pit optimization for copper and molybdenum, which corresponds to the minimum Modified Mining Royalty (refer to discussion in Chapter 3.2.3).

12.2.12 Commodity Price and Market

Southern Copper is currently engaged in and has established a market for selling products from the Toquepala mine. A summary of the market is discussed in Chapter 16.1. Long-term metal prices of US$3.30/lb Cu and US$10.00/lb Mo were used to estimate mineral reserves over the mine life, and were provided by Southern Copper. Supporting information related to these prices can be found in Chapter 16.5.

12.2.13 Cut-off

The mine plan considers a strategy of elevated cut-off for years 2023 to 2026 of the mine plan, with the purpose of increasing early cash flows. Using this strategy, the following approach to cut-off grade for Cu was used to define the material that goes directly to mill/concentrator:

- Years 2023 – 2025: ≥0.25 %Cu
- Year 2026: ≥0.24 %Cu

For those years 2023 to 2026, material below the selected COG (above), and above the NSR cut-off value for leach processing, is sent to the leach dumps. The NSR cut-off value for leach processing is US$0.819/t which equates to ≈0.07 %Cu. This cut-off includes process costs (and royalties) and excludes mining costs; (G&A is included in the process costs).

For years 2027 – 2073 the cut-off applied to material that is destined directly to the mill/concentrator was a variable NSR cut-off value ranging from US$10.84/t to US$12.64/t (0.23 %Cu).

For years 2027 - 2073 mined material below the NSR cut-off value (above), and above the NSR cut-off value for leach processing (US$0.819/t), is sent to the leach dumps.

The formulas used to calculate the concentration and leaching NSR cut-off values were:

- CCO = MC + CC + TC
- LCO = (MC - MCW) + LSEC

where:

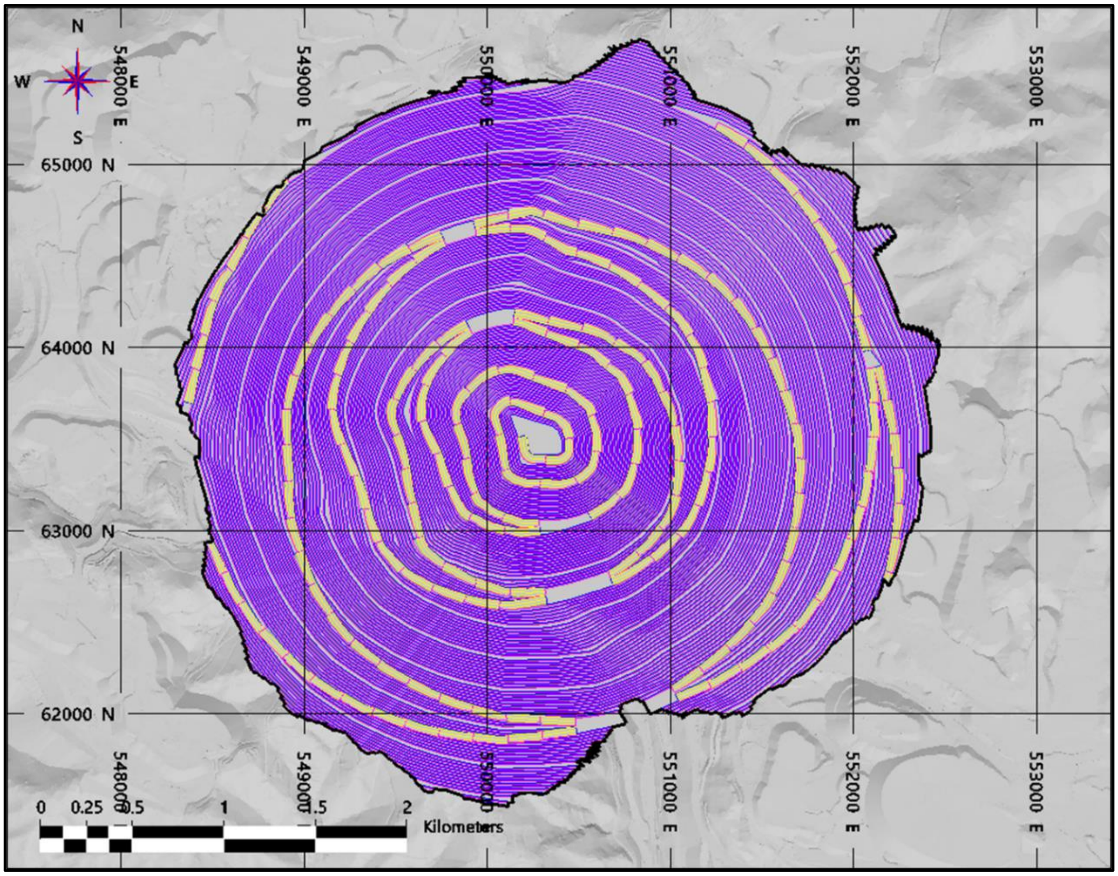
- CCO = concentration cut-off value (US$/t-processed for concentration material)
- LCO = leaching cut-off value (US$/t-processed for leaching material)
- MC = mining cost for mineralized material (US$/t mined)
- MCW = mining cost for waste material (US$/t mined)
- CC = concentration cost (US$/t-processed for concentration material)
- TC = tailing cost (US$/t-processed for concentration material)
- LSEC = leaching and SX/EW cost (US$/t-processed for leaching material)

Costs are stated in the footnotes to Table 12-3 and are based on actual mine operational data and are fixed over the 50 year life of mine.

12.2.14 Pit Design

Figure 12-3 shows a plan view of the final pit design obtained for the Toquepala deposit. This final pit is the result of the extraction of seven mining phases, which are described in more detail in Chapter 13.4.

Figure 12-3: Final Pit Design (Plan View)



(Source: Wood, 2022)

12.2.15 Ore Versus Waste Determinations

The criteria for the determination of ore and waste included the following:

- Indicated mineral resource that was sulfide material was evaluated for being amenable to concentration processing. The economical sulfide material above the concentration NSR cut-off value was defined as concentration/sulfide material.
- The remaining sulfide material, below the selected NSR cut-off value, was then evaluated for amenability to the leaching process. The indicated mineral resource that was above the leaching NSR cut-off value was defined as leaching/leachable material (probable mineral reserve).
- The uneconomic sulfide material below the leaching NSR cut-off value was defined as waste material. All other materials were also defined as waste material.

- The mine plan includes an elevated cut-off strategy for four years where material below this elevated cut-off and above the cut-off for leaching is sent to the leach facility.

The formulas used to calculate the concentration and leaching material NSRs were:

- CNSR = CUG * CCUR * SMCUR * RFCUR * (CUP - CUSC - SMRFC) * (1 - ROY) * CF + MOG * CMOR * (MOP - MOSC) * (1 - ROY) * CF
- LNSR = CUG * (LCUR * LPF) * SECUR * (CUP - COFC + CUCP) * (1 - ROY) * CF

where:

- CNSR = concentration material NSR (US$/t-processed for concentration material)
- LNSR = leaching material NSR (US$/t-processed for leaching material)
- CUG = copper grade (%)
- MOG = molybdenum grade (%)
- CCUR = concentration copper recovery (%)
- CMOR = concentration molybdenum recovery (%)
- LCUR = leaching copper recovery (%)
- LPF = leaching process factor
- SMCUR = smelting copper recovery (%)
- RFCUR = refining copper recovery (%)
- SECUR = SX/EW copper recovery (%)
- CUP = copper price (US$ 3.3/lb)
- MOP = molybdenum price (US$ 10/lb)
- CUSC = copper selling cost (US$/lb Cu)
- MOSC = molybdenum selling cost (US$/lb Mo)
- SMRFC = smelting and refining cost (US$/lb Cu)
- COFC = cathode ocean freight cost (US$/lb Cu)
- CUCP = copper cathode premium (US$/lb Cu)
- ROY = NSR royalty (Modified Mining Royalty) (1 %)
- CF = conversion factor between units (2,204.62 lb/t)

All costs and metal prices used in the mineral reserve determination were fixed over the 50-year life of mine.

12.3 Mineral Reserve Estimate

12.3.1 Mineral Reserve Statement

Mineral reserves are reported using the mineral reserve definitions set out in S-K 1300. The selected point of reference for the mineral reserve estimate is at delivery to the process facility. Mineral reserves are summarized in Table 12-3. No proven mineral reserves have been estimated.

Wood is the QP Firm responsible for the mineral reserve estimates and were prepared by, or under the supervision of appropriately qualified persons. The estimates are current as of December 31, 2022. The leach ore existing in the leach dumps is reported as leach in process.

Table 12-3: Probable Mineral Reserve Statement

Process Type	Tonnes (Mt)	Copper Grade (%)	Molybdenum Grade (%)	Contained Copper (Mlb)	Contained Molybdenum (Mlb)
Concentration	2,144.6	0.47	0.021	22,157.2	1,014.0
Leach	708.6	0.16	—	2,549.5	—
Leach in process	1,794.7	0.15	—	6,118.7	—
Total	**4,647.9**	**0.30**	**—**	**30,825.4**	**1,014.0**

Note: (1) Mineral reserves are current as of December 31, 2022. Wood is the QP Firm responsible for the estimate.

(2) Mineral reserves are constrained within a engineered designed pit based on copper and molybdenum only. The following parameters were used in estimation: assumption of open pit mining methods; assumption of concentration and leaching processes; copper price of US$3.30/lb, molybdenum price of US$10.00/lb; variable NSR cut-off values of US$10.84–US$12.64/t-processed for concentration material; a NSR cut-off value of US$0.819/t-processed for leaching material; mining recovery of 100%; 6% mining dilution; 22% reduction factor applied to molybdenum grade; variable metallurgical recoveries (average LOM recoveries of 88.2% for copper by concentration, 68.1% for molybdenum by concentration, and 16.1% for copper by leaching excluding leach ore existing in leach dumps, and 8.0% for copper by leaching including leach ore existing in leach dumps); average copper recoveries of 97.4% for smelting and 99.9% for refining; variable mining costs that range from US$2.46–US$4.26/t-mined; average process costs of US$8.384/t-processed for concentration material, and US$0.819/t-processed for leaching material; average smelting and refining cost of US$0.382/lb Cu; selling costs of US$-0.0024/lb Cu for concentration process, US$1.679/lb Mo for concentration process, and US$-0.009/lb Cu for leaching process; 1% NSR royalty applied to Cu and Mo; and 60% of the leachable material will be leached and processed by the SX/EW plant.

(3) Numbers in the table have been rounded. Totals may not sum due to rounding.

12.3.2 Uncertainties (Factors) That May Affect the Mineral Reserve Estimate

In the opinion of the QP, areas of uncertainty that may materially impact the mineral reserve estimates include:

- Changes to long-term metal price and exchange rate assumptions
- Changes to metallurgical recovery assumptions
- Changes to the input assumptions used to derive the mineable shapes applicable to the open pit mining methods used to constrain the estimates
- Changes to the forecast dilution and mining recovery assumptions
- Changes to the NSR cut-off values applied to the estimates, for example the material subject to the elevated cut-off strategy
- Variations in geotechnical (including seismicity), hydrogeological and mining assumptions
- Changes to environmental, permitting, and social license assumptions.

To assess the impact of a number of these uncertainties on the mineral reserves, a pit optimization sensitivity analysis was performed in GEOVIA Whittle software for the sulfide and leachable mineralization in the Toquepala life of mine plan by varying the metal price, mining cost, process cost, and metallurgical recovery.

Variations in the metal price and metallurgical recovery generate the greatest impact on the mineral reserve estimates. However, a variation in mining and process costs also generates a significant impact on the mineral reserve estimates.

13.0 MINING METHODS

13.1 Introduction

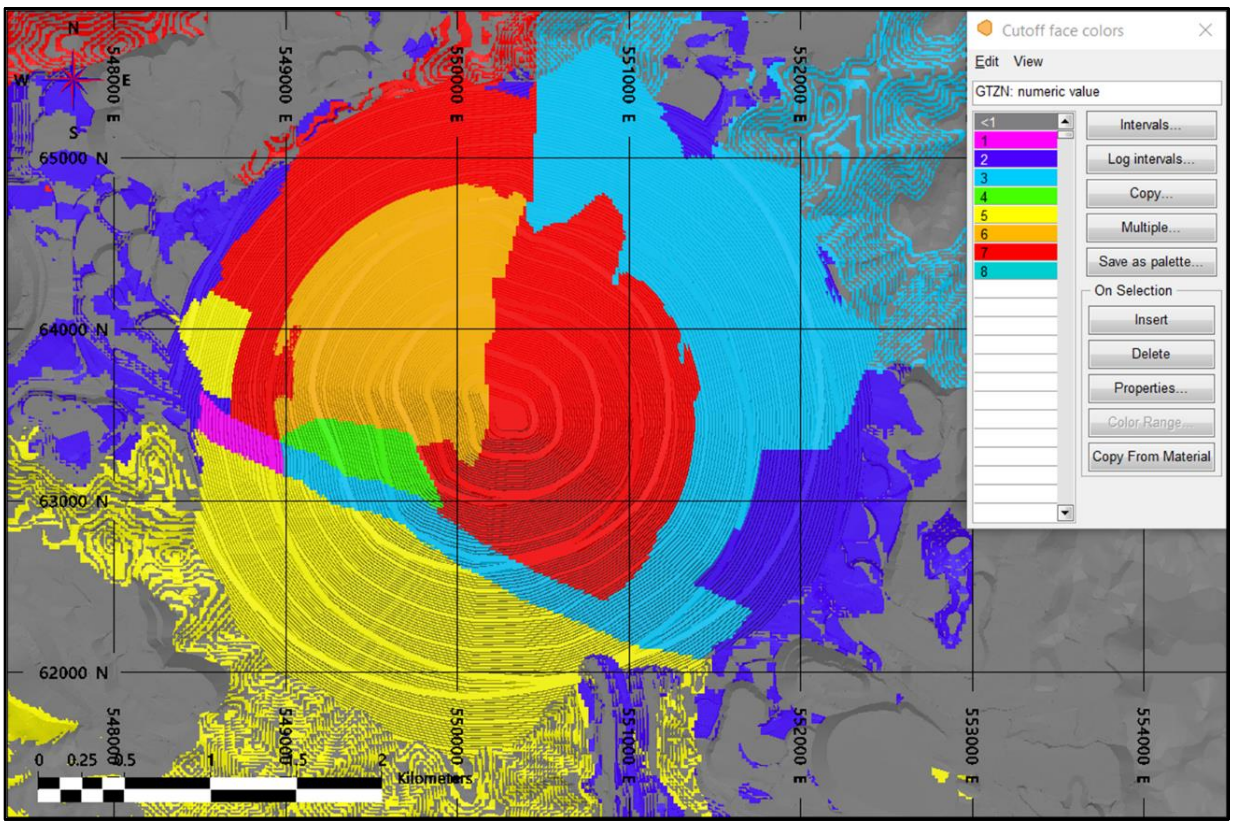
The Toquepala Operations use conventional truck-and-shovel open pit mining methods.

13.2 Geotechnical Considerations

Geotechnical criteria used in the pit optimization were provided in Chapter 12.2.5. The geotechnical zones in relation to the pit outline are shown in Figure 13-1, and the pit slopes used in mine design are included in Table 13-1.

The fill material parameters were used by default for all blocks with an undefined GTZN code.

Figure 13-1: Geotechnical Zones Projected to Final Pit Design Surface



(Source: Wood, 2022)

Table 13-1: Pit Slope Design Criteria by Geotechnical Zones

Zone	GTZN Code	Bench Height (m)	Bench Face Angle (degree)	Inter-Ramp Angle (degree)	Catch Berm Width (m)
M	1	15	65	36	13.7
Fill	2	15	65	37	12.9
M, IV, VII	3	15	65	38	12.2
II	4	15	65	42	9.7
III	5	15	65	43	9.1
V	6	15	65	44	8.5
I, VI	7	15	65	45	8.0

13.3 Hydrogeological Considerations

Water that accumulates in the base of the pit from rainfall sources is pumped out of the pit; the pump is capable of extracting 120 L/s. The water is used for dust suppression when enough water is collected.

13.4 Operations

13.4.1 Pit Phases

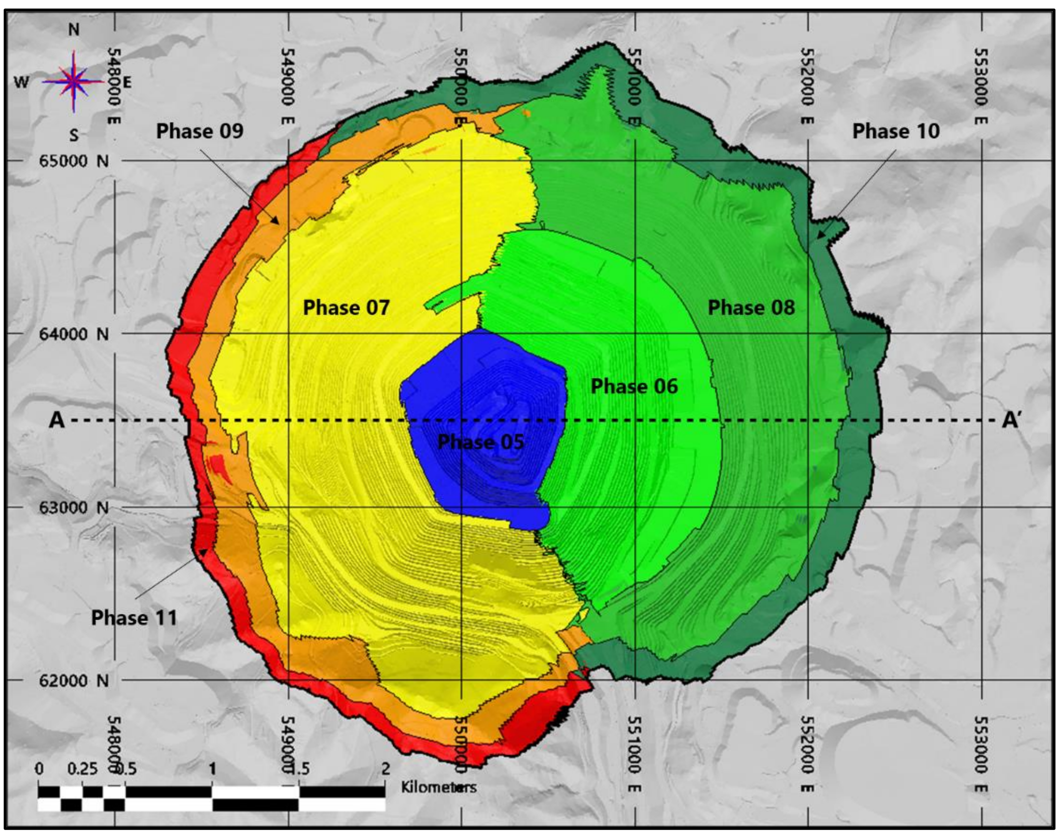
The open pit mine has a circular conical shape with a diameter of approximately 3.1 km. Currently, the highest elevation of the pit walls is on the east wall at 3,665 masl. The current bottom of the pit is at 2,650 masl, while the depth of the final pit design will be in 2,140 masl.

Seven pit phases remain in the life-of-mine (LOM) plan, starting with phase 5 and ending with phase 11. The parameters used in the phase designs are summarized in Table 13-2. The final pit is shown by phase in Figure 13-2 and in cross-section view in Figure 13-3.

Table 13-2: Pit Design Criteria Summary

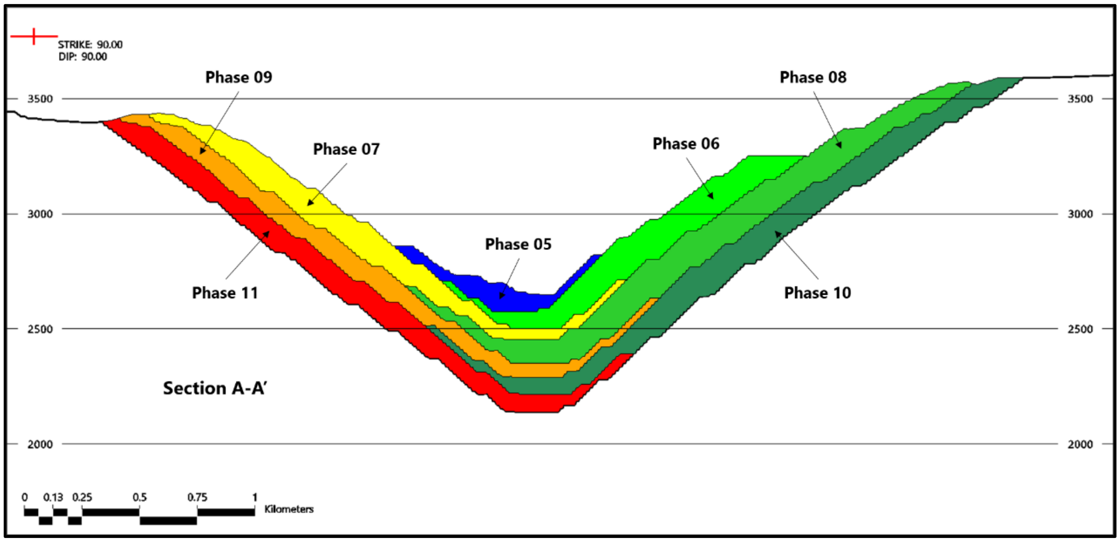
Design Criteria	Unit	Value
Bench height	m	15
Minimum mining width	m	100
Ramp width	m	37.5
Ramp gradient	%	8
Inter-ramp height	m	150
Geotechnical berm width	m	20
Bench face angle	degree	65
Inter-ramp angle	degree	See Table 13-1
Catch berm width	m	See Table 13-1

Figure 13-2: LOM Pit Phases



(Source: Wood, 2022)

Figure 13-3: LOM Pit Phases (Section View)



(Source: Wood, 2022)

13.4.2 Throughput

The mine plan assumed a maximum mining capacity of 260 Mt of annual movement and a nominal processing rate of 120 kt/d of sulfide material at the milling/concentration facility and 140 kt/d of leachable material at the leach facility.

13.4.3 Operations

The mining operations are shown in the flow diagram in Figure 13-4.

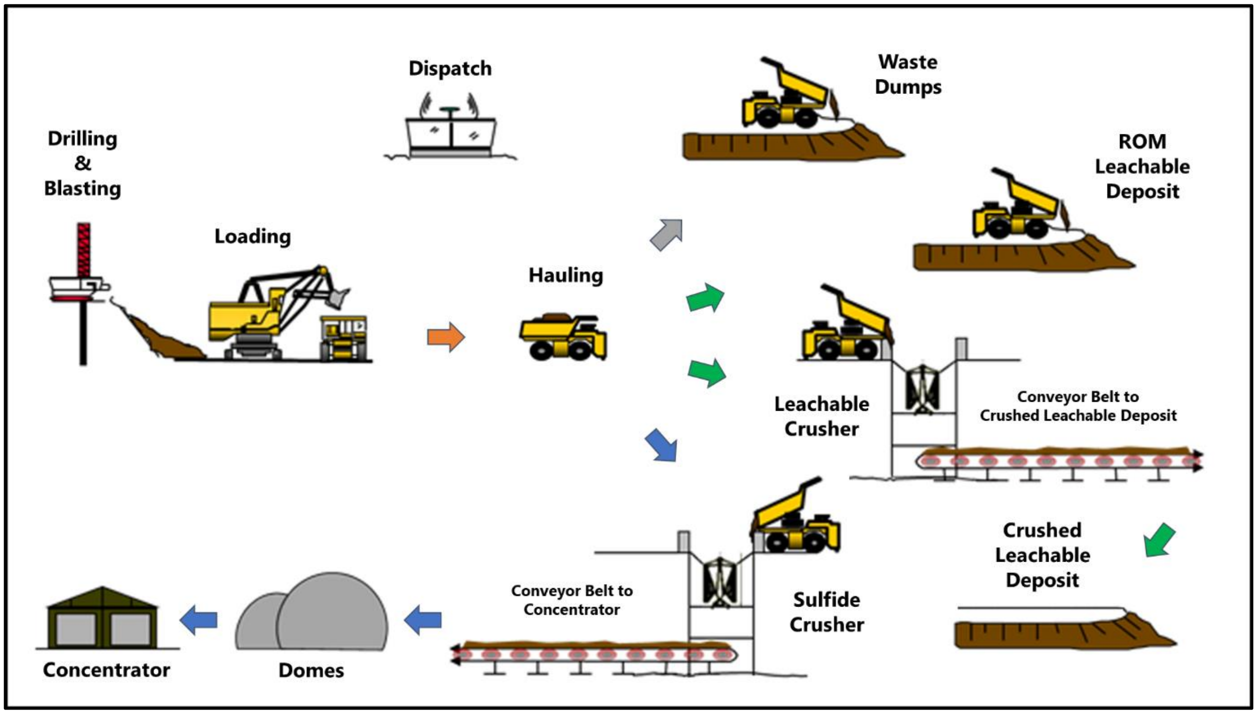
Mining is conducted using two 12-hr shifts. The mining operations can be summarized as:

- Initial drilling and blasting
- Loading, using shovels, of the blasted material into haul trucks
- Transport of ore and waste, depending on destination to WRSFs, run-of-mine (ROM) heap leach dump, leachable crusher, and sulfide crusher.

The sulfide crusher is located at elevation 3,260 masl in the southern zone of the pit. From the crusher, the crushed material is transported using a 2.0 km long conveyor belt to the west through a tunnel to the concentrator plant. The sulfide crusher throughput is a nominal 120 kt/d.

Material destined for the heap leach dumps can be sent either directly to the ROM leach dump, or to the leachable crusher that is currently located at elevation 3,255 masl in the southern zone of the pit. Once crushed, the material is conveyed via a 6.5 km long conveyor to the crushed leach dump. The leachable crusher has a nominal capacity of 140 kt/d, and the conveyor has a transport capacity of 8,350 t/h. The leachable crusher will be relocated in front of the sulfide crusher at level 3260, and is expected to be fully operational by the beginning of 2025.

Figure 13-4: Mine Operation Flow Diagram



(Source: Wood, 2022)

13.4.4 Production Plan

The LOM plan assumes that all material that will be processed by concentration goes to the sulfide crusher. All material that will be processed by dump leaching goes primarily to the leachable crusher and the remaining material is sent to the ROM leach dump. The point of transfer from mining to processing is at the point of the conveyors or delivery to the ROM leach dump.

Three pit phases will be operational at any one time, to ensure that production rates can be met. A maximum mining capacity per phase of 200 Mt/a is assumed, with a maximum vertical advance rate of 10 benches per year. The mine plan assumes:

- 2023: phases 5 and 6 are in the production stage and phase 7 is undergoing stripping.
- 2027: phase 8 will commence stripping, and phases 5, 6, and 7 will be in production.
- 2032: phase 9 will commence stripping, and phases 6, 7, and 8 will be in production.
- 2041: phase 10 will commence stripping, and phases 8 and 9 will be in production.
- 2051: phase 11 will commence stripping, and phases 9 and 10 will be in production.
- 2061: phase 11 will be in production.

Four WRSFs will be used:

- The northwest WRSF will be used from 2023 to 2028, and will receive material mainly from phases 6 and 7.
- The north WRSF will be used from 2025 to 2072, and will receive material mainly from phases 9, 10, and 11.
- The east WRSF will be used from 2023 to 2052, and will receive material mainly from phases 6, 7, and 8.
- The south WRSF will be used from 2032 to 2067, and will receive material mainly from phases 8, 9, and 10.

The material movement envisaged in the LOM plan is provided in Figure 13-5.

The mine plan considers a strategy of elevated cut-off for years 2023 to 2026 of the mine plan, with the purpose of increasing early cash flows.

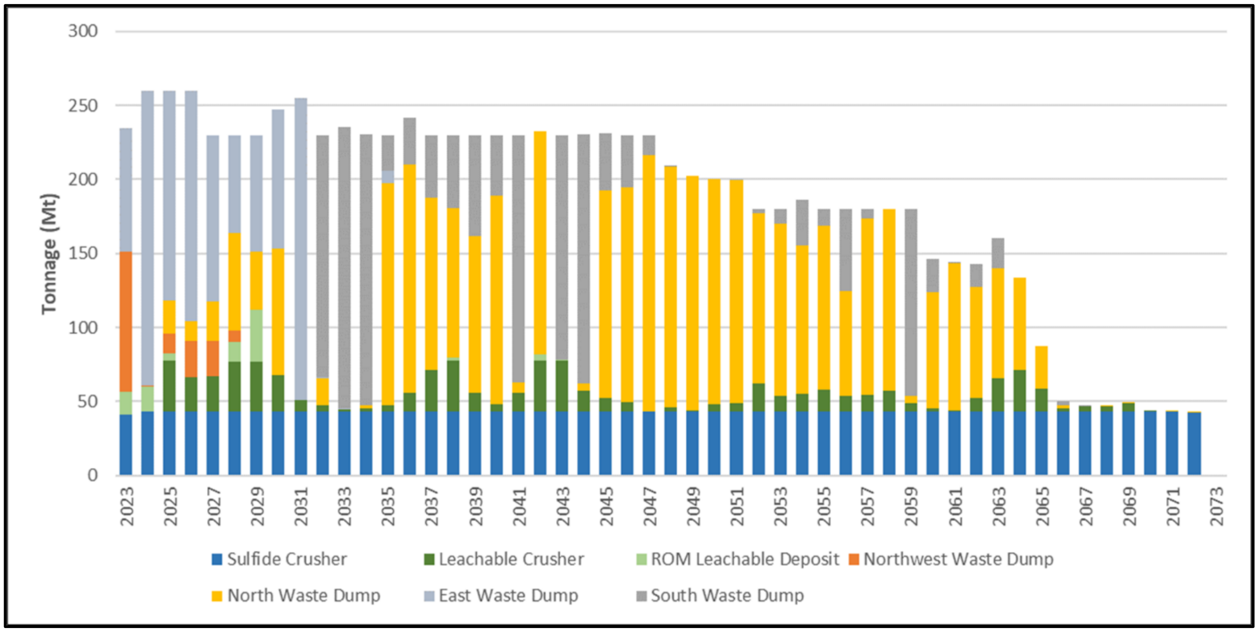
Figure 13-6 shows that the mine plan is expected to maintain a constant feed of approximately 42.9 Mt/a to the sulfide crusher for most of the LOM. The average copper grades are expected vary from 0.3–0.7%.

The leachable crusher will operate at a maximum effective capacity of 34.5 Mt/a (Figure 13-7). The crusher will need to be relocated as the pit expands. Two years of shutdown are included in the plan (years 2023 and 2024). During this period, all material will be sent to the ROM leach dump.

Table 13-3 and Table 13-4 show the material movement on an annualized basis.

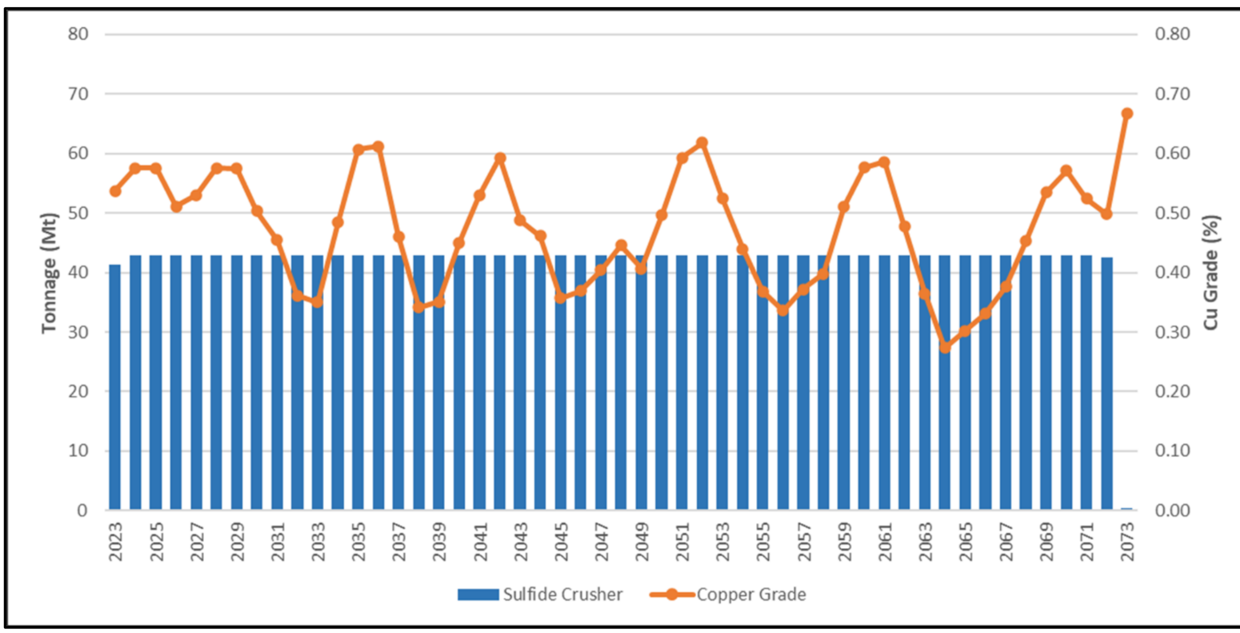
The final LOM pit layout plan is provided in Figure 13-8.

Figure 13-5: LOM Material Movement by Destinations



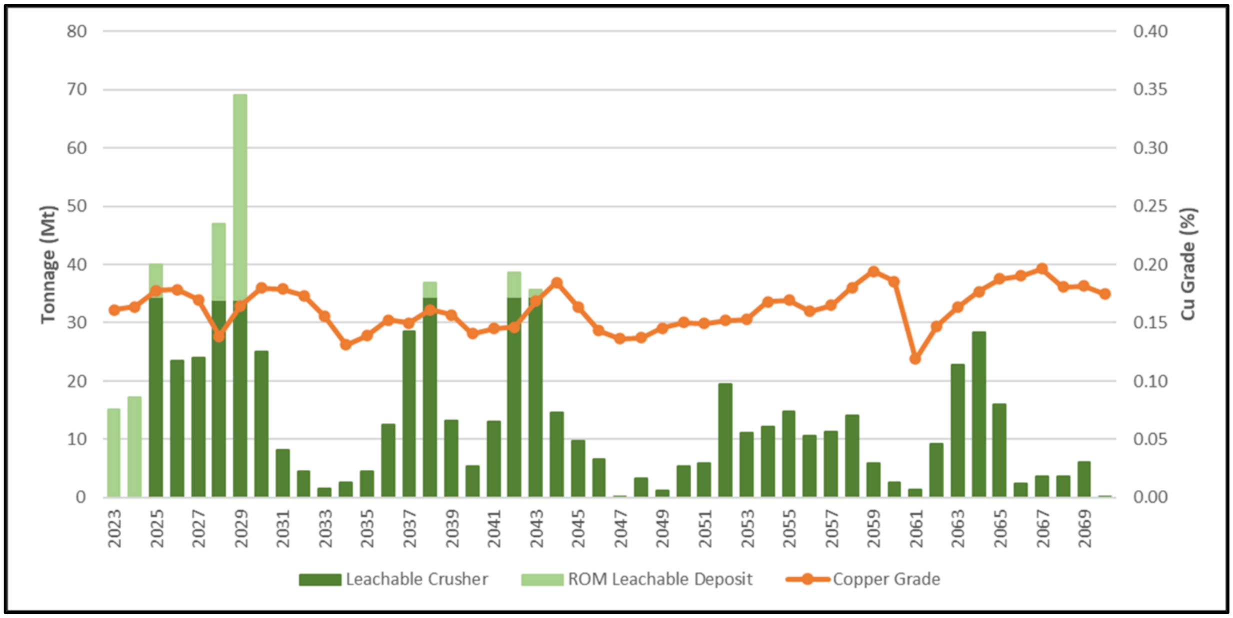
(Source: Wood, 2022). Note: "ROM Leachable Deposit" = "ROM Heap Leach Dump"

Figure 13-6: LOM Feed to Sulfide Crusher



(Source: Wood, 2022)

Figure 13-7: LOM Feed to Leachable Crusher and ROM Heap Leach Dump



(Source: Wood, 2022). Note: "ROM Leachable Deposit" = "ROM Heap Leach Dump"

Table 13-3: LOM Material Movement Plan (Sulfide and Leachable Material)

	Sulfide Material					Leachable Material					
	Sulfide Crusher					Leachable Crusher			ROM Heap Leach Dump		
		Grade		Recovery							
Year	Tonnage (Mt)	Cu (%)	Mo (%)	Cu (%)	Mo (%)	Tonnage (Mt)	Cu Grade (%)	Cu Recovery (%)	Tonnage (Mt)	Cu Grade (%)	Cu Recovery (%)
2023	41.3	0.54	0.021	88.5	64.9	-	-	-	15.1	0.16	17.5
2024	42.9	0.58	0.023	89.1	66.1	-	-	-	17.2	0.16	15.1
2025	42.9	0.58	0.023	89.1	66.5	34.5	0.18	15.1	5.4	0.15	16.0
2026	42.9	0.51	0.020	88.9	66.3	23.5	0.18	15.0	-	-	-
2027	42.9	0.53	0.018	88.7	65.5	24.0	0.17	16.6	-	-	-
2028	42.9	0.57	0.017	89.2	63.9	34.0	0.13	17.4	13.0	0.15	16.6
2029	42.9	0.57	0.025	89.2	67.1	34.0	0.16	16.5	35.1	0.17	16.2
2030	42.9	0.50	0.020	89.1	65.9	25.0	0.18	16.4			
2031	42.9	0.45	0.023	88.2	68.3	8.2	0.18	18.0	-	-	-
2032	42.9	0.36	0.019	86.7	69.1	4.5	0.17	18.5	-	-	-
2033	42.9	0.35	0.008	86.5	57.7	1.6	0.16	20.6	-	-	-
2034	42.9	0.48	0.016	88.2	62.4	2.7	0.13	18.6	-	-	-
2035	42.9	0.61	0.025	89.1	65.7	4.4	0.14	15.8	-	-	-
2036	42.9	0.61	0.034	89.3	70.0	12.6	0.15	16.1	-	-	-
2037	42.9	0.46	0.030	88.1	73.3	28.5	0.15	17.0	-	-	-
2038	42.9	0.34	0.009	86.5	64.4	34.5	0.16	16.7	2.4	0.12	17.8
2039	42.9	0.35	0.007	86.6	57.4	13.2	0.16	16.2	-	-	-
2040	42.9	0.45	0.009	87.9	58.0	5.4	0.14	16.7	-	-	-

Year	Sulfide Material – Sulfide Crusher					Leachable Material – Leachable Crusher			Leachable Material – ROM Heap Leach Dump		
	Tonnage	Grade		Recovery							
	(Mt)	Cu (%)	Mo (%)	Cu (%)	Mo (%)	Tonnage (Mt)	Cu Grade (%)	Cu Recovery (%)	Tonnage (Mt)	Cu Grade (%)	Cu Recovery (%)
2041	42.9	0.53	0.013	88.7	61.0	13.1	0.15	15.8	-	-	-
2042	42.9	0.59	0.019	89.1	63.7	34.4	0.15	16.4	4.1	0.14	15.5
2043	42.9	0.49	0.017	88.6	65.9	34.5	0.17	15.4	1.1	0.19	15.0
2044	42.9	0.46	0.020	88.2	67.5	14.5	0.18	15.4	-	-	-
2045	42.9	0.36	0.014	86.9	67.6	9.7	0.16	17.3	-	-	-
2046	42.9	0.37	0.014	86.9	67.8	6.5	0.14	21.4	-	-	-
2047	42.9	0.40	0.019	87.3	70.1	0.2	0.14	19.5	-	-	-
2048	42.9	0.45	0.023	87.8	69.9	3.4	0.14	19.0	-	-	-
2049	42.9	0.41	0.037	87.7	72.3	1.2	0.15	16.4	-	-	-
2050	42.9	0.50	0.011	88.2	58.8	5.3	0.15	15.3	-	-	-
2051	42.9	0.59	0.017	89.0	63.1	5.9	0.15	15.8	-	-	-
2052	42.9	0.62	0.028	89.1	68.1	19.4	0.15	16.5	-	-	-
2053	42.9	0.53	0.043	88.5	73.5	11.1	0.15	16.2	-	-	-
2054	42.9	0.44	0.039	87.9	73.9	12.1	0.17	15.9	-	-	-
2055	42.9	0.37	0.021	87.0	69.9	14.8	0.17	16.3	-	-	-
2056	42.9	0.34	0.007	86.3	56.7	10.6	0.16	17.0	-	-	-
2057	42.9	0.37	0.009	86.8	58.1	11.3	0.16	16.1	-	-	-
2058	42.9	0.40	0.011	87.2	58.8	14.1	0.18	15.5	-	-	-
2059	42.9	0.51	0.019	88.4	63.6	6.0	0.19	14.1	-	-	-
2060	42.9	0.58	0.035	89.0	69.1	2.5	0.19	14.1	-	-	-

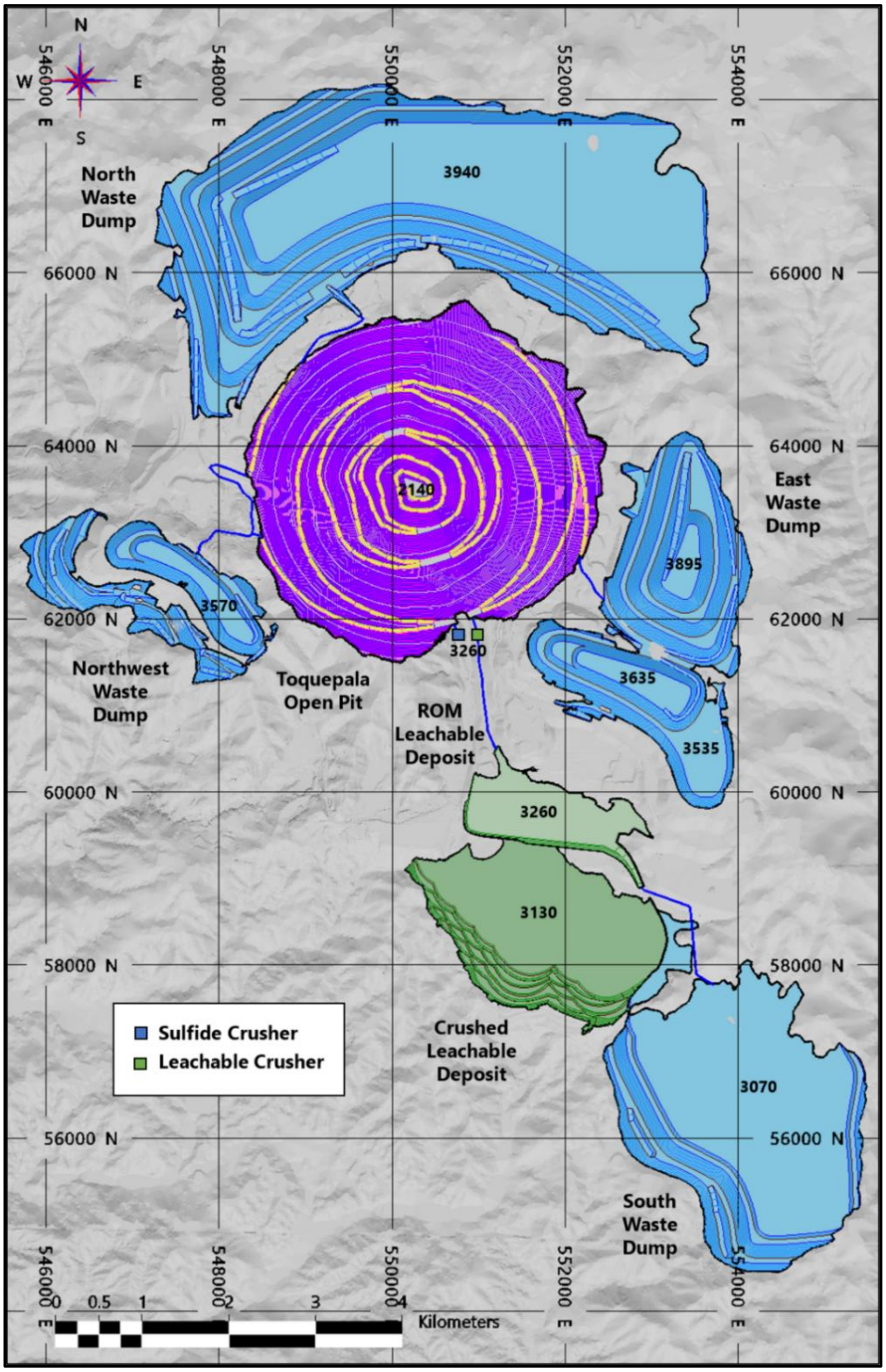
Year	Sulfide Material – Sulfide Crusher					Leachable Material – Leachable Crusher			Leachable Material – ROM Heap Leach Dump		
	Tonnage	Grade		Recovery							
	(Mt)	Cu (%)	Mo (%)	Cu (%)	Mo (%)	Tonnage (Mt)	Cu Grade (%)	Cu Recovery (%)	Tonnage (Mt)	Cu Grade (%)	Cu Recovery (%)
2061	42.9	0.59	0.055	89.1	72.5	1.3	0.12	18.6	-	-	-
2062	42.9	0.48	0.055	88.3	74.5	9.2	0.15	15.9	-	-	-
2063	42.9	0.36	0.033	87.1	73.2	22.8	0.16	14.9	-	-	-
2064	42.9	0.27	0.003	85.5	50.4	28.3	0.18	14.8	-	-	-
2065	42.9	0.30	0.003	85.8	48.7	16.0	0.19	14.8	-	-	-
2066	42.9	0.33	0.004	86.2	51.3	2.5	0.19	14.9	-	-	-
2067	42.9	0.38	0.006	86.9	54.2	3.7	0.20	15.7	-	-	-
2068	42.9	0.45	0.010	87.8	58.7	3.7	0.18	17.4	-	-	-
2069	42.9	0.53	0.020	88.5	64.2	6.1	0.18	18.4	-	-	-
2070	42.9	0.57	0.038	88.7	69.5	0.2	0.17	21.4	-	-	-
2071	42.9	0.52	0.045	88.5	71.4	-	-	-	-	-	-
2072	42.6	0.50	0.037	88.3	70.9	-	-	-	-	-	-
2073	0.5	0.67	0.029	89.6	67.4	-	-	-	-	-	-
Total/Average	**2,144.6**	**0.47**	**0.021**	**88.2**	**68.1**	**614.9**	**0.16**	**16.1**	**93.6**	**0.16**	**16.2**

Table 13-4: LOM Material Movement Plan (Waste and LOM Total)

	Waste Material by WRSF				All Materials
Year	**Northwest Tonnage (Mt)**	**North Tonnage (Mt)**	**East Tonnage (Mt)**	**South Tonnage (Mt)**	**Grand Total Tonnage (Mt)**
2023	95.1	-	83.5	-	235.0
2024	0.5	-	199.4	-	260.0
2025	12.7	23.0	141.4	-	260.0
2026	24.5	13.3	155.8	-	260.0
2027	23.8	26.6	112.6	-	230.0
2028	8.0	66.2	65.8	-	230.0
2029	-	39.3	78.6	-	230.0
2030	-	85.6	94.0	-	247.5
2031	-		204.1	-	255.2
2032	-	18.2	0.5	163.9	230.0
2033	-	0.5	0.3	190.2	235.5
2034	-	1.8	-	183.3	230.6
2035	-	150.1	8.8	23.8	230.0
2036	-	154.5	-	31.9	241.9
2037	-	116.2	-	42.4	230.0
2038	-	101.0	-	49.2	230.0
2039	-	105.3	0.6	68.0	230.0
2040	-	140.9	-	40.8	230.0
2041	-	6.5	-	167.5	230.0
2042	-	150.9	-		232.3
2043	-		-	151.4	230.0
2044	-	5.0	-	167.8	230.2
2045	-	140.1	-	38.2	230.9
2046	-	145.2	0.03	35.3	230.0
2047	-	173.1	0.001	13.7	230.0
2048	-	162.2	-	0.1	208.6
2049	-	158.3	-	-	202.4
2050	-	151.8	-	-	200.0

	Waste Material by WRSF				All Materials
Year	Northwest Tonnage (Mt)	North Tonnage (Mt)	East Tonnage (Mt)	South Tonnage (Mt)	Grand Total Tonnage (Mt)
2051	-	151.1	0.01	-	200.0
2052	-	114.9	0.2	2.5	180.0
2053	-	116.3	-	9.6	180.0
2054	-	100.6	-	30.5	186.1
2055	-	110.8	-	11.5	180.0
2056	-	70.8	-	55.7	180.0
2057	-	119.6	-	6.2	180.0
2058	-	123.0	-		180.0
2059	-	4.5	-	126.6	180.0
2060	-	78.8	-	21.8	146.0
2061	-	99.0	-	-	143.3
2062	-	75.2	-	15.2	142.6
2063	-	74.3	-	20.4	160.4
2064	-	62.8	-	-	134.0
2065	-	28.5	-	-	87.4
2066	-	2.3	-	2.2	49.9
2067	-	0.3	-	0.6	47.5
2068	-	0.1	-	-	46.7
2069	-	0.1	-	-	49.1
2070	-		-	-	43.1
2071	-	0.5	-	-	43.5
2072	-	0.4	-	-	43.0
2073	-		-	-	0.5
Total	**164.6**	**3,469.8**	**1,145.9**	**1,669.9**	**9,303.3**

Figure 13-8: LOM Layout Plan



(Source: Wood, 2022). Note: The figure shows the relocated leachable crusher. "Leachable Deposit" = "Heap Leach Dump"

13.5 Equipment

Production drilling (11–12¼ inch diameter) is carried out using electrical equipment for production drilling, and pre-split drilling (5-inch diameter) uses diesel equipment.

For blasting, Quantex explosive and electronic detonators are used in all blasts. Drills are relocated as needed, and for longer distances, can be transported using a lowboy.

Electric shovels (bucket capacities from 56–74 yd^3) and front-end loaders are used to load haul trucks. The shovels are primarily used for the mining of final slopes, production, and ramps. The front-end loaders are generally used in narrower zones, in pioneering pit phases, and for auxiliary work.

Haul trucks vary in capacity, from 218–363 tonnes, and are used to transport material to the different end destinations, such as the WRSFs, ROM leach dump, leachable crusher, and sulfide crusher.

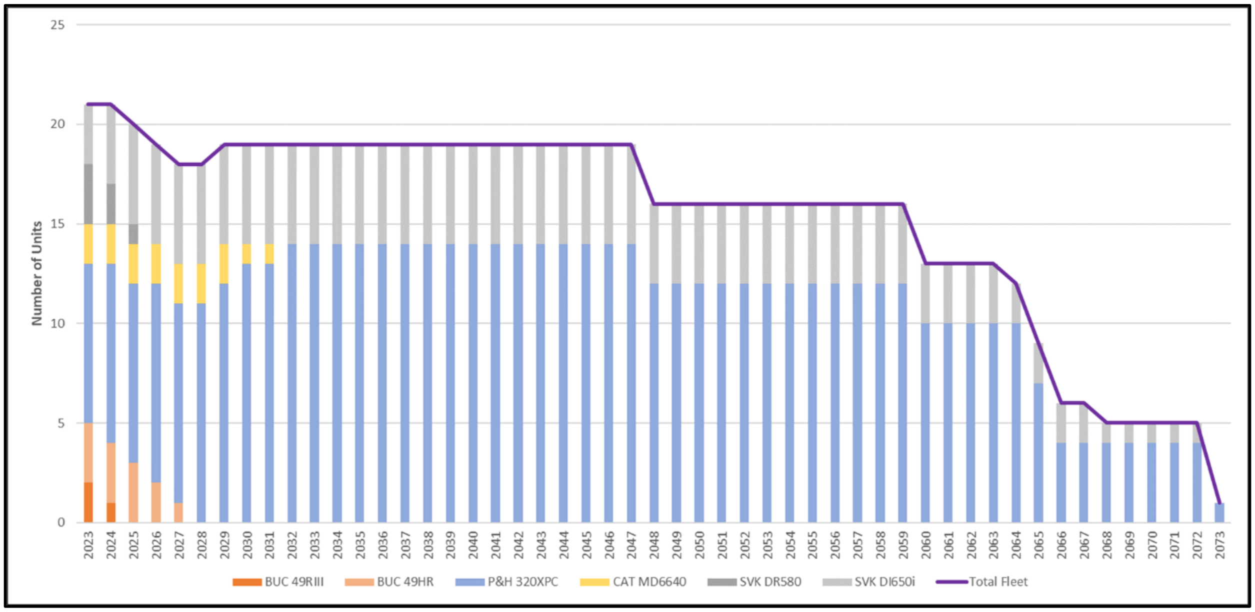
Track (crawler) dozers are used for ramp construction and pioneer phases, provide support to front-end loaders, and are used for WRSF maintenance. Wheel dozers are used primarily for road maintenance, in conjunction with motor graders. Water trucks are used for dust control. An excavator fleet is employed in slope profiling, mining of crests and narrow areas, pioneering phases, and reconfiguration of the WRSFs.

Equipment breakdowns by number and period are provided in Figure 13-9 to Figure 13-11. Peak requirements by machinery type are summarized in Table 13-5.

13.6 Personnel

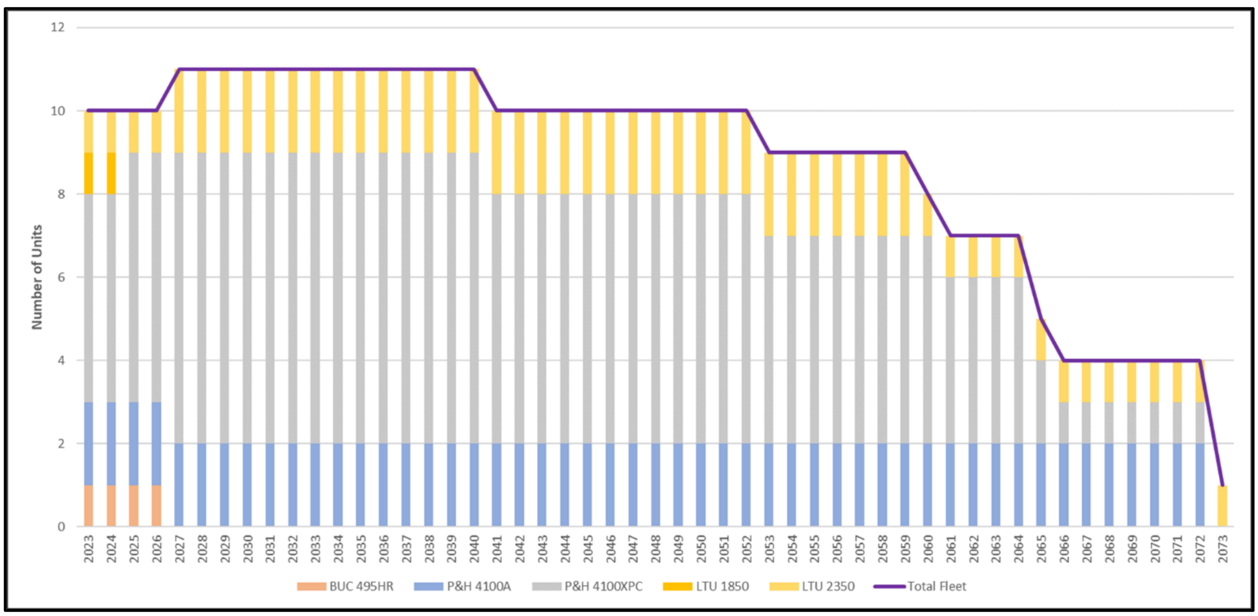
Peak personnel numbers are estimated at 702 employees in the LOM plan, including technical, management, operational, and maintenance personnel.

Figure 13-9: LOM Drilling Equipment Requirements



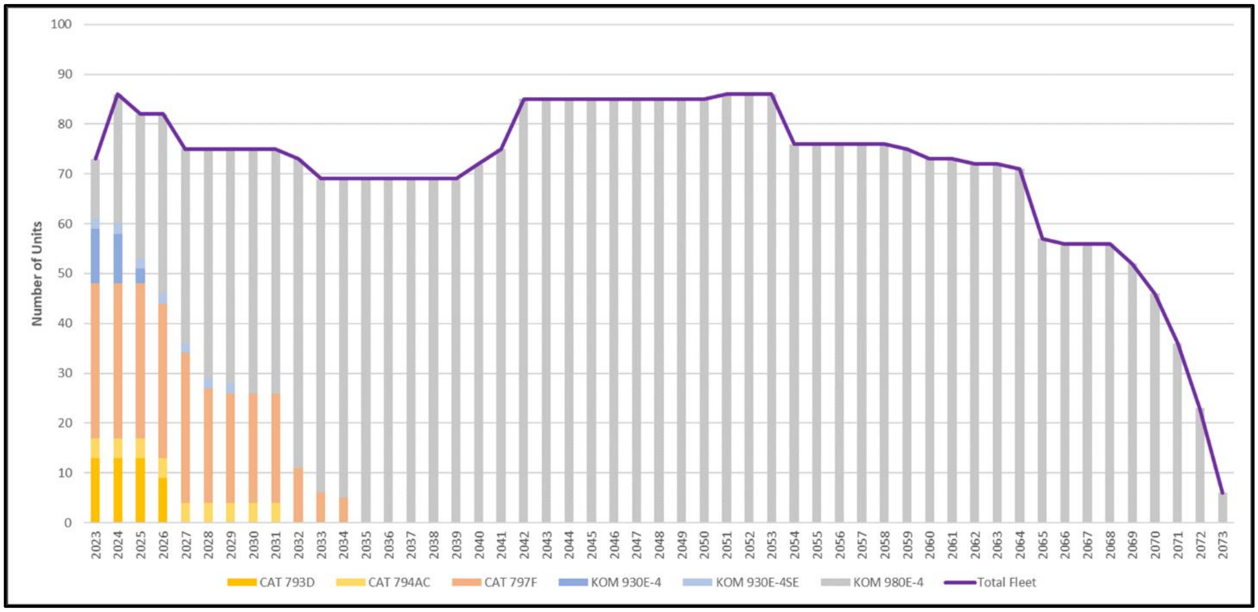
(Source: Wood, 2022)

Figure 13-10: LOM Loading Equipment Requirements



(Source: Wood, 2022)

Figure 13-11: LOM Haulage Equipment Requirements



(Source: Wood, 2022)

Table 13-5: LOM Peak Equipment Requirements

Area	Equipment Type	Peak
Drilling	BUC 49RIII – electric drill	2
	BUC 49HR – electric drill	3
	P&H 320XPC – electric drill	14
	CAT MD6640 – electric drill	2
	SVK DR580 – diesel drill	3
	SVK DI650i – diesel drill	5
Loading	BUC 495HR – electric shovel	1
	P&H 4100A – electric shovel	2
	P&H 4100XPC – electric shovel	7
	LTU 1850 – front-end loader	1
	LTU 2350 – front-end loader	2
Hauling	CAT 793D – truck	13
	CAT 794AC – electric truck	4
	CAT 797F – truck	31
	KOM 930E-4 – electric truck	11
	KOM 930E-4SE – electric truck	2
	KOM 980E-4 – electric truck	86
Support	CAT D10T – crawler dozer	2
	CAT D11T – crawler dozer	14
	KOM D475A – crawler dozer	1
	CAT 834 – wheel dozer	15
	KOM WD600 – wheel dozer	5
	CAT 24M – motor grader	6
	CAT 777F – water truck	2
	CAT 785C – water truck	1
	KOM HD1500 – water truck	5
	CAT 374 – excavator	3
	KOM PC800LC – excavator	2

14.0 PROCESSING AND RECOVERY METHODS

14.1 Process Method Selection

The process designs were based on existing technologies and proven equipment. The process plants are installed and are operating, and have a multi-decade operating history.

The Toquepala LESDE plant was designed to treat low-grade sulfides from the Toquepala mine which are uneconomical to be treated in the concentrators. The material is deposited in dumps and a portion of the contained copper is recovered by conventional dump leaching and SX/EW.

Toquepala Concentrators No.1 (C1) and No. 2 (C2) are designed to treat sulfide material and produce copper and molybdenum concentrates.

The copper concentrates produced are treated at the Ilo smelter and refinery to produce copper cathodes as the final product.

14.2 Flowsheets

Summary flowsheets for the heap leach operation and C1 and C2 are provided in Figure 14-1, Figure 14-2, and Figure 14-3 respectively.

14.3 Heap Leach and Solvent Extraction–Electrowinning Circuit

14.3.1 Overview

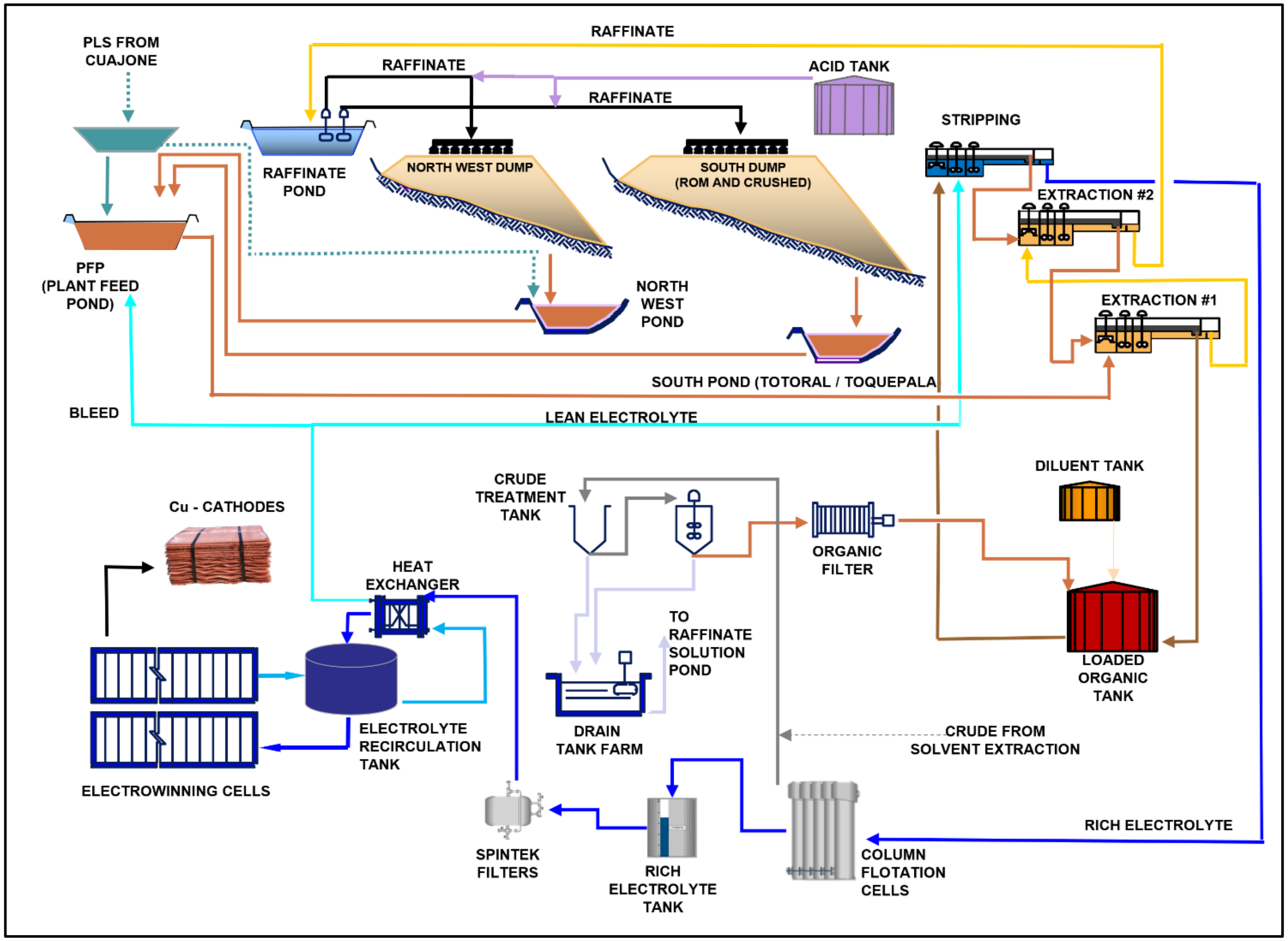
The LESDE plant has a current annual production of 56,336 t of cathode copper, and includes conventional processes used for the recovery of copper such as acidic leaching of low-grade dumps, SX and EW facilities.

Copper is recovered from two sources:

- Loaded pregnant leach solution (PLS) coming from the oxide leaching plant located at the Cuajone mine, approximately 30 km north of Toquepala
- Low-grade heap leach dumps at the Toquepala mine.

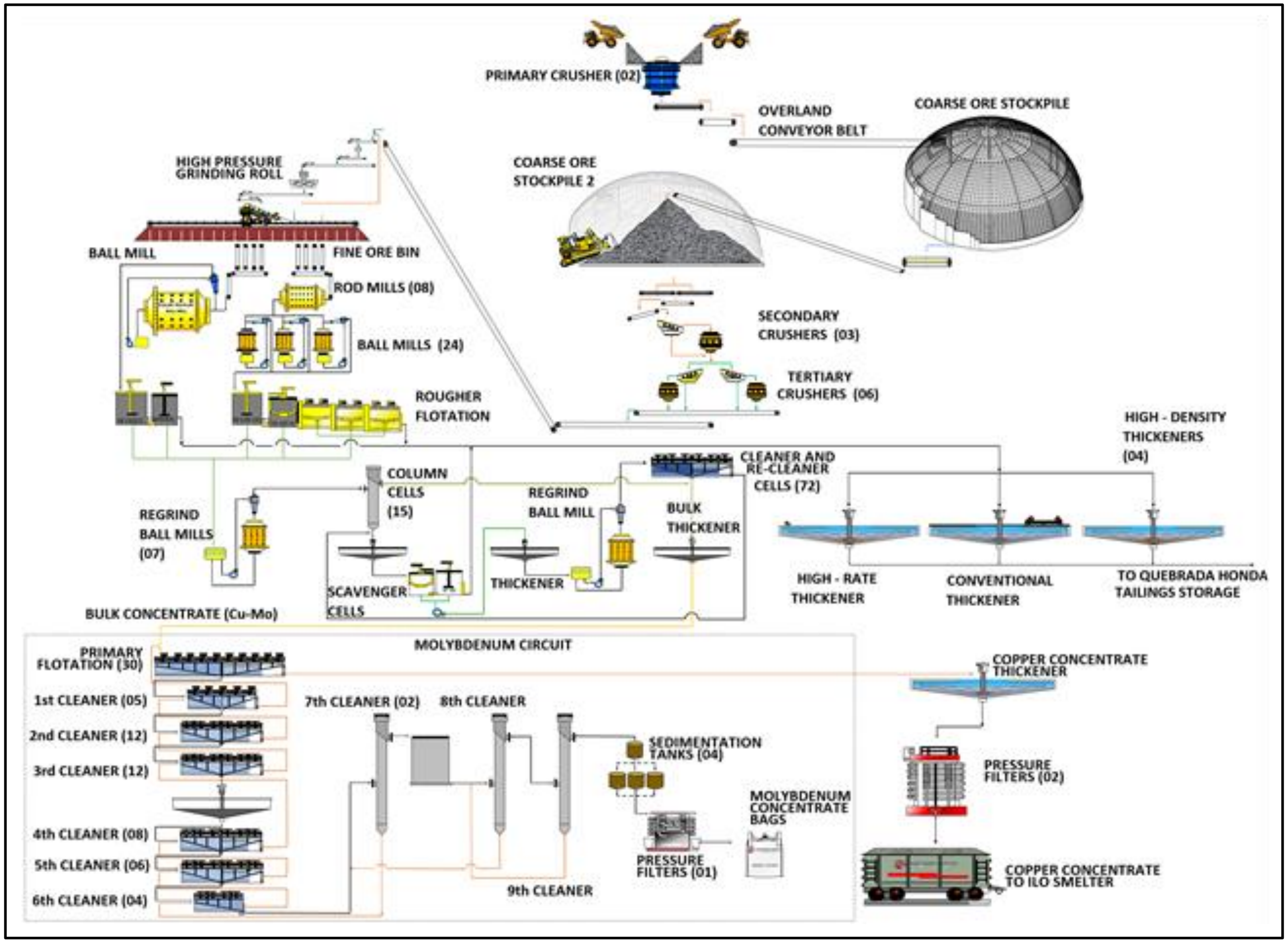
The sulfuric acid required in the LESDE plant is produced by acid plants located at the Ilo smelter.

Figure 14-1: Toquepala Summary Flowsheet Leaching–SX/EW Plant



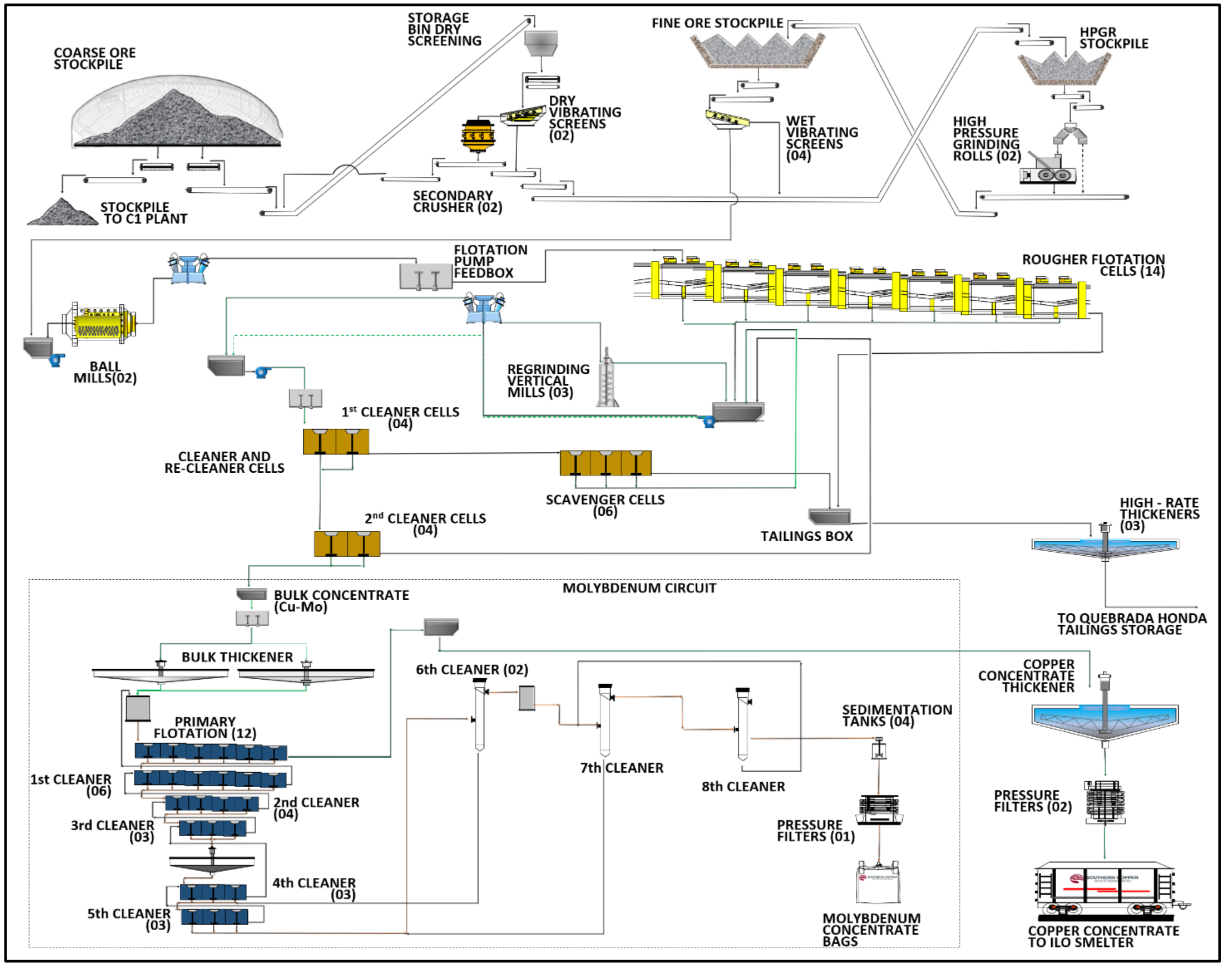
(Source: Southern Copper, 2021)

Figure 14-2: Summary Flowsheet Toquepala Concentrator No. 1



(Source: Southern Copper, 2021)

Figure 14-3: Summary Flowsheet Toquepala Concentrator No. 2



(Source: Southern Copper, 2021)

14.3.2 Sulfide Leaching

The heaps are situated to the south and northwest of the Toquepala open pit, are >100 m in height and have widely variable granulometry.

A network of pipes distributes irrigation solutions via a series of leaching strips (irrigation areas). Through these irrigation lines the material is first conditioned with a sulfuric acid solution before being irrigated with raffinate solution. Sulfides are leached through prolonged irrigation periods that include resting periods to promote oxidation of sulfide copper minerals.

Periodically, the leach dump is ripped to improve air circulation, to promote bacteria that oxidize the iron and sulfur from the low-grade sulfides. Ripping also facilitates a more efficient percolation of the irrigation solution from the surface of the leach dump into the interior of the heap.

Raffinate flows by gravity through the ore dissolving the copper to obtain a PLS. The PLS is collected in collection ponds located in the lower part of the leaching dumps and pumped to the SX stage. During the 2021 operating year, the PLS produced from leaching had a copper content of 0.704 g/L of copper in solution.

The Toquepala low-grade primary sulfide leaching has averaged a copper recovery of about 36% over the last 15 years.

14.3.3 Solvent Extraction

At the solvent extraction circuit, the PLS generated is purified and the copper content is concentrated to obtain a rich electrolyte.

The SX circuit is a counter-current extraction of copper from the PLS to an organic solution, and then to an electrolyte solution for electrowinning. This rich electrolyte solution is sent to a tank farm area where the rich electrolyte is further purified by flotation and filtration to remove fine solids and trapped organic reagent. After purification, the electrolyte is heated through heat exchangers and then sent to the electrowinning circuit.

The SX circuit at Toquepala consists of a nine conventional mixer-settler tanks divided in three trains operating in parallel. Each train, named A, B and C, has two extraction tanks (2E) and one re-extraction or stripping tank (1S). In the first two mixer-settlers of each train (2E) the PLS is mixed with a copper-free organic solution or stripped organic. The organic solution selectively captures the copper ions from the PLS solution leaving the other undesirable ions (impurities) in the aqueous solution. The aqueous solution, or raffinate, has a very low copper concentration and is then acidified and returned to the Toquepala leach dumps.

The copper-loaded organic advances to the stripping stage where it is mixed with a spent electrolyte coming from the electrowinning circuit. At the stripping stage, due to a high concentration of acid in the spent electrolyte, the copper loaded in the organic phase is discharged back to the electrolyte solution forming a copper-loaded rich electrolyte. After purification at the tank farm, the rich electrolyte advances to the electrowinning circuit, whereas the stripped organic returns to the extraction stage.

14.3.4 Electrowinning

In the electrowinning circuit, the copper contained in the rich electrolyte solution is plated onto stainless steel cathode blanks by action of direct current. Copper cathodes with a purity of 99.999% are stripped off the blanks and sold as a final product. The spent electrolyte is returned to the stripping stage at the SX circuit.

The EW operations at Toquepala consist of two tank houses. At the North tank house, the EW process is performed in 122 polymer concrete cells, each cell containing 62 cathodes and 63 anodes. The South tank house hosts 40 cells, each cell containing 64 anodes and 63 cathodes. The South tank house has been on care and maintenance since 2005.

The electrolyte enters each cell from the bottom through a perforated PVC pipe that evenly distributes the rich electrolyte in each cell. By action of the applied direct current the copper is plated on the stainless-steel cathodes. The electrolyte overflows from the cells with a lower concentration of copper and is pumped back to the SX circuit as spent electrolyte. The stainless-steel plates remain submerged for a controlled period of time until an adequate copper cathode weight is achieved. The cathodes are removed from the electrowinning cells by using an overhead crane and sent to the cathode stripping machine.

The copper deposited on the stainless-steel sheets is delaminated using a cathode stripping machine. The copper sheets or cathodes pass through a corrugating press, depending on the customer's requirements, forming bundles of no more than 2,500 kg. The stainless-steel sheets return to the cells for the next cycle of electrowinning. The copper bundles are manually secured with steel strapping and taken by forklift to railway platforms for shipment to the Port of Ilo, from where the bundles are routed to either domestic or international destinations.

14.3.5 Equipment Sizing

A summary of the equipment requirements for the heap leach and SX/EW facility is included in Table 14-1.

Table 14-1: Toquepala LESDE Plant Major Process Equipment

Function	Description	Quantity
Raffinate pumping	400 HP pumps	2
	800 HP pumps	4
	1500 HP pumps	3
PLS pumping	800 HP pumps	5
	1500 HP pumps	9
	1750 HP pumps	6
	2000 HP pumps	1
Extraction/stripping	Mixer-settler tanks, HDPE/concrete, 25 HP mixers	9
Organic pumping	125 HP pumps	4
Electrolyte pumping	125 HP pumps	10
Crud removal	Centrifuge	1
Electrolyte filtration	Filters, 30 m^3 capacity, each	5
Electrolyte heating	Heat exchangers	6
Copper electrowinning (North tank house)	Rectifiers, 23,000 A, each	2
	Electrolytic cells, 62 cathodes, 63 anodes	122

14.3.6 Power and Consumables

14.3.6.1 Power

Power consumption in the LOM is based on copper production, and is expected to decrease as the copper production decreases. There is sufficient power capacity available to support the LOM plan.

14.3.6.2 Water

The Toquepala Operations use surface and underground water from a variety of sources as a fresh make up water. All sources discharge into the Pampa de Vaca lagoon from where the fresh water is supplied to the various process plants.

In the LESDE plant, fresh water is required mainly for the replacement of losses due to evaporation and wetting of dry leachable material.

Water supplies are expected to be sufficient for the purposes of the LOM plan.

14.3.6.3 Consumables

The primary consumables in the LESDE plant include sulfuric acid, diluent, extractant, cobalt sulfate and grain refining.

The LOM plan envisages that the same consumables will be used for the duration of the LOM plan.

14.3.7 Personnel

Personnel numbers include 55 multifunctional operators and 17 staff employees, employed in operations, technical services and maintenance.

14.4 Sulfide Process Plant

14.4.1 Overview

The Toquepala C1 concentrator started operations in 1959 and was initially designed to process 32,660 t per day of ore. Since then, many changes and upgrades have been made to increase the processing capacity, and the current capacity is 60,000 t/d.

The Toquepala C2 concentrator started operations in November 2018, with a design capacity of 60,000 t/d.

The ore in both plants is treated in a conventional concentration circuit consisting of crushing, grinding and flotation of copper and molybdenum minerals. The copper concentrate is transported by rail to the Ilo Smelter for treatment and the molybdenum concentrate is bagged and sold as a final product.

14.4.2 Toquepala Concentrator No. 1

14.4.2.1 Primary Crushing

ROM material is received from the open pit by truck and unloaded onto two primary gyratory crushers (60 x 113 inch) located to the north of the open pit. Crushed material (nominal 80%

passing size (P80) of 140 mm) is then collected in a discharge box at the bottom of the crusher. An arrangement of two conveyors transports the crushed material for approximately 2,200 m to temporary storage in coarse ore stockpile No.1 with a capacity of 141,000 t.

14.4.2.2 Secondary and Tertiary Crushing

Four apron feeders reclaim ore from beneath coarse ore stockpile No. 1, and the ore is transported to coarse ore stockpile No. 2 with a capacity of 60,000 t. Ore from stockpile No. 2 is delivered to three double-deck vibrating screens (two that are 7 x 14 ft and one that is 8 ft x 14 ft) via belt feeders. The oversize material feeds three MP-800 secondary cone crushers to generate a particle size product of minus 38 mm. Undersize material from the screens and the product of the crushers is then screened in six tertiary screens.

The coarse fraction from the tertiary screens is crushed in six conical tertiary crushers. The product from the crushers and the fine product from the tertiary screens are then transported to a HPGR surge bin. The feed to the HPGR has a particle size average of 12–14 mm.

14.4.2.3 Quaternary Crushing

Fine material from the high pressure grinding roll (HPGR) surge bin unloads onto a 2.4 x 1.65 m HPGR with an installed power of 5.3 MW. The HPGR product is conveyed to a fines hopper of 25,000 t of capacity. The HPGR produces material in the range of 8–10 mm.

14.4.2.4 Grinding

Grinding is performed in two parallel lines. The first line uses eight rod mills rated at 746 kW as the primary grinding stage, and 24 ball mills rated at 597 kW each as the secondary grinding stage. The second line uses a single stage 21 x 33.5 ft ball mill with an installed power of 7,085 kW working in closed circuit with cyclones. Product slurry from both lines is monitored by particle size analyzers and fed to the flotation stage with an average particle size of 200 µm.

14.4.2.5 Bulk Flotation

Primary bulk flotation is carried out in five flotation lines. Four lines consist of one cell of 130 m^3, one cell of 100 m^3 and six cells of 42.5 m^3. The fifth flotation line consists of two cells of 130 m^3 and four cells of 60 m^3. The primary bulk concentrate is then fed to seven 8 x 13 ft (260 kW) regrind ball mills working in closed circuit with cyclones.

The regrind product is fed to a bulk cleaning stage via two distributors. The south distributor distributes the concentrate to eight 8 x 40 ft conventional column cells, and the north distributor distributes the concentrate to seven 8 x 40 ft column cells. Concentrate from the cleaning flotation has a metal grade of 26.5% Cu and 1.0% Mo. Tails from the cleaning flotation are transferred to two intermediate thickeners (N°1 and N°2) to increase the solids contents and to condition the tails for a scavenger flotation stage.

Scavenger flotation is performed in three tank cells of 50 m^3 and one cell of 60 m^3. The scavenger concentrate is transferred to an intermediate thickener and then pumped to an 8 x 13 ft regrinding mill (260 kW). Re-grinded scavenger concentrate is fed to three re-cleaning flotation lines, each one with 24 cells of 1.13 m^3 capacity. Scavenger tails together with the rougher flotation tails make up the final tailings. Re-cleaning flotation tails are returned to the scavenger flotation stage.

Concentrate from the re-cleaning flotation joins the concentrate from the cleaning flotation to form the bulk copper–molybdenum concentrate. The bulk concentrate is the final product of the bulk flotation plant and is sent by gravity to the 140 ft diameter copper–molybdenum thickener.

14.4.2.6 Molybdenum Plant

The molybdenum plant processes the copper–molybdenum bulk concentrate in a rougher circuit and nine cleaner stages. The bulk concentrate is fed to the rougher circuit composed of 30 cells each with 2.83 m^3 capacity. Tails from the rougher stage is sent to the 30.5 m diameter copper concentrate thickener. Rougher concentrate is pumped to the 1st cleaner stage (5 x 2.83 m^3 cells), and the concentrate from the 1st cleaner is fed to the 2nd cleaner stage (12 x 40 ft^3 cells) together with the 3rd cleaner tails. Tails from the 1st cleaner return to the rougher flotation stage.

Concentrate from the 2nd cleaner together with the 4th cleaner stage tails are fed to the 3rd cleaner stage which consists of twelve 40 ft^3 cells. Concentrate from the 3rd cleaner, after passing through an intermediate thickener, is pumped to the 4th cleaner stage together with tails from the 5th cleaner stage. Concentrate from the 4th cleaner stage (eight 40 ft^3 cells) is pumped to the 5th cleaner stage that consist of six cells of 40 ft^3 and its concentrate is sent to the 6th cleaner stage (four 40 ft^3 cells). Concentrate from the 6th cleaner stage feeds the 7th cleaner stage and the tails return to the 5th cleaner cells.

The 7th cleaning is performed in two 3 x 40 ft column cells and the concentrate from the 7th cleaning is thermally treated in two heat exchangers. The treated concentrate is fed to the 8th cleaning stage and the tail returns to the 6th cleaning. The 8th cleaning stage is performed in one 3.5 x 40 ft column cell and its concentrate is fed to the 9th cleaning stage (2 x 40 ft column cell). Tails from the 8th cleaning returns to the 7th cleaning stage. The concentrate from the 9th cleaning stage is the final molybdenum concentrate.

The final molybdenum concentrate is decanted in four tanks and pumped to a 40 t/d vertical filter. Dried molybdenum concentrate is bagged and sold as the final product. Filtration Plant

Copper concentrate (copper–molybdenum rougher tailings) is thickened in a 100 ft copper concentrate thickener to 60% solids. The thickener underflow is pumped to a distributor tank that feeds the concentrate to two vertical Larox filters with capacities of treating 600 t and 960 t/d of concentrates. Both filters produce concentrates cakes with 8.5–10% moisture. Final copper concentrate is transported by rail to the Ilo smelter and refinery for processing.

14.4.2.7 Tailings Thickening

All tailings generated in the flotation circuit are discharged to a tailings distribution box. The tailings are evenly distributed to three 46 m hi-density thickeners. The overflow water is recycled, pumped to two recovered water tanks, and reused as process water in the grinding and flotation circuits. The underflow from the thickeners, at 60% solids, comprises the final tailings and is sent by gravity to the Quebrada Honda tailings storage facility (TSF).

14.4.3 Toquepala Concentrator No. 2

14.4.3.1 Primary Crushing

The C1 primary crushing circuit is shared with C2. From coarse ore stockpile No. 1 the material is fed to the C2 secondary crushing circuit with a nominal 80% passing size (P_{80}) of 140 mm.

14.4.3.2 Secondary Crushing

Four apron feeders reclaim ore from beneath coarse ore stockpile No. 1 and transfer it to a secondary crushing surge bin of 1,648 t of capacity. Two apron feeders under the surge bin deliver ore to two double-deck banana screens of 3.4 x 7.6 m. The oversize feeds two MP-1250 secondary crushers producing a P_{80} product of 50 mm. Undersize material from the screens and the product of the crushers are transferred to the tertiary crushing stage.

14.4.3.3 Tertiary Crushing

The product from the previous crushing stage is temporarily stored in a HPGR surge bin before being fed to two 2.4 x 1.65 m HPGRs. Each HPGR has an installed power of 5,300 kW and operates in closed circuit with four wet screens. Product from the HPGRs (-18 mm) is transferred to four double-deck vibrating screens (3.7 x 8.5 m) through a surge bin. The ore is wet classified, producing an undersize fine slurry that becomes the feed to the grinding circuit, and a coarse washed oversize material that is recirculated to the HPGR surge bin.

14.4.3.4 Grinding

Grinding is done in two parallel lines where each line consists of a cyclone feed pumpbox, a cyclone cluster (12 x 33 inches), and a gearless ball mill (7.6 x 12.4 m effective grinding length) rated at 15 MW. The cyclone pumpbox receives the product slurry from the HPGR wet screening at 31% solids and the ball mill product at 72% solids. Water is added to the pumpbox to control the solids content before the slurry is pumped to the cyclone cluster at 55% solids. Cyclone overflow slurry at a P_{80} of 180 µm is the flotation circuit feed, whereas cyclone underflow is gravity fed to the ball mills. Operating in closed circuit with the cyclones, the ball mill product is discharged to the cyclone pumpbox at a circulating load rate of 350%.

14.4.3.5 Bulk Flotation

Primary bulk flotation is performed in two flotation lines. Each line consists of seven 300 m^3 cells, of which five cells are forced-air type and two cells are induced-air type. Tailings from primary flotation flow by gravity to a tailings collector box. The primary bulk concentrate gravity flows to a regrind cyclone pumpbox where the cyclone underflow is fed to two VTM-1250 (932 kW) vertical regrind mills working in closed circuit with cyclones.

The regrind cyclone overflow product with a P_{80} of 33 µm is fed to two lines of 1st cleaning flotation via a distributor. Each line consists of two 130 m^3 induced-air cells producing a concentrate that gravity feeds to a 2nd cleaning stage. Tails from the cleaning flotation are transferred to a scavenger flotation stage consisting of two lines of three 130 m^3 cells each. Scavenger concentrate is returned to the regrind pumpbox and the scavenger tails join the rougher tails at the tailings collector box as final tails.

The 1st cleaner concentrate gravity flows to the 2nd cleaning flotation consisting of two lines of two 70 m^3 cells. The 2nd cleaner tails gravity flow to the regrind cyclone pumpbox. The 2nd cleaner concentrate is the final bulk copper–molybdenum concentrate and is sent to a 40 m diameter bulk thickener at the molybdenum plant.

14.4.3.6 Molybdenum Plant

The C2 molybdenum plant processes the copper–molybdenum bulk concentrate in a rougher circuit and eight cleaner stages. The bulk copper–molybdenum concentrate is fed from the bulk thickener underflow to the rougher circuit, composed of two lines of six 8.5 m^3 cells each. Tails from the rougher stage is pumped to a 40 m diameter copper concentrate thickener. Rougher concentrate from both lines is pumped to the 1st cleaner stage (6 x 4.25 m^3 cells), and the concentrate from the 1st cleaner is fed to the 2nd cleaner stage (4 x 4.25 m^3 cells) together with the 3rd cleaning tails. Tails from the 1st cleaner returns to the rougher flotation stage.

Concentrate from the 2nd cleaner together with the 4thcleaner stage tails are fed to the 3rd cleaner stage of three 4.25 m^3 cells. Concentrate from the 3rd cleaner, after passing through an intermediate thickener, is pumped to the 4th cleaner stage together with tails from the 5th cleaner stage. Concentrate from the 4th cleaner stage (three 4.25 m^3 cells) is pumped to the 5th cleaner stage consisting of three 4.25 m^3 cells. Concentrate from the 5th cleaner stage feeds the 6th cleaner stage and the tails return to the 4th cleaner cells.

The 6th cleaning stage is carried out in two 1.1 x 10.5 m (10 m^3) column cells. The concentrate from the 6th cleaning is thermally treated in a heat exchanger increasing the slurry temperature to around 65°C. The treated concentrate is then fed to the 7th cleaning stage, and the tails return to the 6th cleaner cells. The 7th cleaning stage is performed in one 1.1 x 10.5 m column cell and its concentrate is fed to the 8th cleaning stage (1.1 x 10.5 m column cell). Tails from the 8th cleaning returns to the 7th cleaning stage. Concentrate from the 8th cleaning stage is the final molybdenum concentrate.

The final molybdenum concentrate is decanted in four tanks to achieve 40% solids and then pumped to a filter press. Filtered molybdenum concentrate is deposited in 1,950 kg bags and sold as the final product.

The LOM expected molybdenum recovery for both concentrators is estimated at 68.1% based on an average Mo concentrate grade of 55.80%.

14.4.3.7 Filtration Plant

Copper concentrate (copper–molybdenum rougher tailings) is thickened in a conventional 40 m thickener to 65% solids. Thickener underflow is pumped to a distributor tank that feeds the concentrate to two vertical Larox filters of 96 m^2 each. Product from the filters is a concentrate cake of 8–10 moisture. Final copper concentrate is transported by rail to the Ilo smelter for processing.

The LOM expected copper recovery for both concentrators is estimated at 88.2% based on an average copper grade of 25.52%.

14.4.3.8 Tailings Thickening

Rougher and scavenger tailings from the tailings collection box are discharged to a tailings distribution box. The tailings are evenly distributed to three 46 m hi-rate thickeners. The overflow water is recycled, pumped to recovered water tanks, and reused as process water in the grinding and flotation circuits as needed. The underflow from the thickeners, at an average of 61% solids, is sent by gravity to the Quebrada Honda TSF.

14.4.4 Equipment Sizing

Equipment requirements for C1 and C2 are summarized in Table 14-2 and Table 14-3.

14.4.5 Power and Consumables

14.4.5.1 Power

The total power consumption for the Toquepala C1 and C2 plants in the 2021 operating year was 411.2 MWh and 444.8 MWh respectively. Grinding represented about 51.4% and 51.2% of the total consumed power in C1 and C2. Power supplies are expected to be sufficient for the purposes of the LOM plan.

14.4.5.2 Water

Water sources are discussed in Chapter 14.3.6.2.

Make up water in C1 and C2 is required to replace that lost in concentrates, tailings sent to the TSF and evaporation. Recycled water from the Quebrada Honda TSF is pumped primarily to the Toquepala C2 plant at an average rate of 200 L/s.

Water supplies are expected to be sufficient for the purposes of the LOM plan.

Table 14-2: C1 Major Process Plant Equipment

Function	Description	Quantity
Primary crushing (C1 & C2)	Gyratory crusher, 60 ”x 113”	2
Secondary crushing	Cone crushers, Metso MP-800, 597 kW each	3
Tertiary crushing	Cone crushers, HP-700, 522 kW each	4
	Cone crushers, HP-800, 597 kW each	2
Quaternary crushing	HPGR, 2.4 m x 1.65 m, 5.3 MW	1
Primary grinding	Fuller ball mill, 21 ft D x 33.5 ft L, 7,085 kW	1
	Marcy rod mills, 10 ft D x 14 ft L, 597 kW	8
Secondary grinding	Allis Chalmers ball mill, 10.5 ft D x 13 ft L, 597 kW	19
	Svedala ball mill, 10.5 ft D x 13 ft L, 597 kW	4
	Marcy ball mill, 10.5 ft D x 14 ft L, 597 kW	1
Rougher con. regrind	Marcy ball mills, 8 ft D x 13 ft L, 260 kW	7
Rougher flotation	Wemco cells, 130 m^3	6
	Outokumpu cells, 100 m^3	4
	Wemco cells, 42.5 m^3	24
	Wemco cells, 60 m^3	4
Cleaner flotation	Column cells, 8 ft x 40 ft	15
Scavenger flotation	Outokumpu Cells, 50 m^3	3
	Wemco Cells, 60 m^3	1
Scavenger con. regrind	Marcy Ball Mill, 8 ft x 13 ft, 260 kW	1
Re-cleaner flotation	Agitair No. 48 Cells, 1.13 m^3	72
Mo rougher	Wemco Cells, 2.83 m^3	30
Mo 1st cleaner	Agitair No. 48 Cells, 1.13 m^3	5
Mo 2nd cleaner	Agitair No. 48 cells, 1.13 m^3	12
Mo 3rd cleaner	Agitair No. 48 cells, 1.13 m^3	12
Mo 4th cleaner	Agitair No. 48 cells, 1.13 m^3	8
Mo 5th cleaner	Agitair No. 48 cells, 1.13 m^3	6
Mo 6th cleaner	Agitair No. 48 cells, 1.13 m^3	4
Mo 7th cleaner	Column cells, 3 ft x 40 ft	2
Mo 8th cleaner	Column cells, 3.5 ft x 40 ft	1
Mo 9th cleaner	Column cells, 2 ft x 40 ft	1
Mo Con. filter	Larox 4 chambers filter, 40 dry t per day.	1
Cu con. filter	Larox PF-60 10 plates filter, 600 dry t per day.	1
	Larox PF-96 16 plates filter, 960 dry t per day.	1
Tailings thickening	Tenova hi-density thickener, 46 m diameter	3

Table 14-3: C2 Major Process Plant Equipment

Function	Description	Quantity
Primary crushing (C1 & C2)	Gyratory crusher, 60 "x 113", 750 kW each	2
Secondary crushing	Cone crushers, Metso MP-1250, 932 kW each	2
Tertiary crushing	HPGR, 2.4 m x 1.65 m, 5.3 MW	2
Primary grinding	Ball mill, 7.6 ft D x 12.4 EGL, 15 MW each	2
Rougher con. regrind	Vertical mills VTM-1250, 932 kW each	2
Rougher flotation	Dorr Oliver type cells, 300 m^3	10
	Wemco type cells, 300 m^3	4
1st cleaner flotation	Flotation cells, 130 m^3	4
Scavenger flotation	Flotation cells, 130 m^3	6
2nd cleaner flotation	Flotation cells, 70 m^3	4
Mo rougher	Wemco type cells, 8.5 m^3	12
Mo 1st cleaner	Wemco type cells, 4.25 m^3	6
Mo 2nd cleaner	Dorr Oliver type cells, 4.25 m^3	4
Mo 3rd cleaner	Dorr Oliver type cells, 4.25 m^3	3
Mo 4th cleaner	Dorr Oliver type cells, 4.25 m^3	3
Mo 5th cleaner	Dorr Oliver type cells, 4.25 m^3	3
Mo 6th cleaner	Eriez EFD column cells, 1.1 x 10.5 m, 10 m^3	2
Mo 7th cleaner	Eriez EFD column cells, 1.1 x 10.5 m, 10 m^3	1
Mo 8th cleaner	Eriez EFD column cells, 1.1 x 10.5 m, 10 m^3	1
Mo con. filter	Larox PF, 7.9 m^2, 5 plates	1
Cu con. filter	Larox PF, 96 m^2, 16 plates	2
Tailings thickening	Tenova Hi-rate thickener, 46 m dia. x 13.7 m height	3

14.4.5.3 Consumables

The primary consumables used in the concentration process include flotation reagents such as: collectors, frother, flocculant, sodium hydrosulfide, and lime. Steel grinding media are consumed during comminution in the ball and vertical mills.

The LOM plan envisages that the same consumables will be used for the duration of the LOM plan.

14.4.6 Personnel

The total personnel operating C1 and C2 consists of 240 employees, working in the areas of management, operations, process and general services, and the TSF.

14.5 Ilo Smelter

14.5.1 Overview

The Ilo smelter commenced operations in 1960 to support the Toquepala Operations and was expanded in 1976 to accommodate the Cuajone Operations. In 1995 a Teniente converter and the first acid and oxygen plants were implemented. At that time the Ilo smelter operated with two reverberatory furnaces and one Teniente converter as smelting units, seven Peirce Smith converters, two blister casting plants, and one acid and oxygen plant.

In 2007 a new smelter was commissioned with a nominal capacity of 1,200,000 t/a of copper concentrate. The new smelter consists of one single Isasmelt smelting unit associated with two rotary holding furnaces, four Peirce Smith converters, two anode furnaces associated with twin anode casting wheels, two acid plants, two oxygen plants, and auxiliary services plants.

The Ilo smelter processes the copper concentrates from the Cuajone and Toquepala concentrators and produces copper anodes for the Ilo refinery.

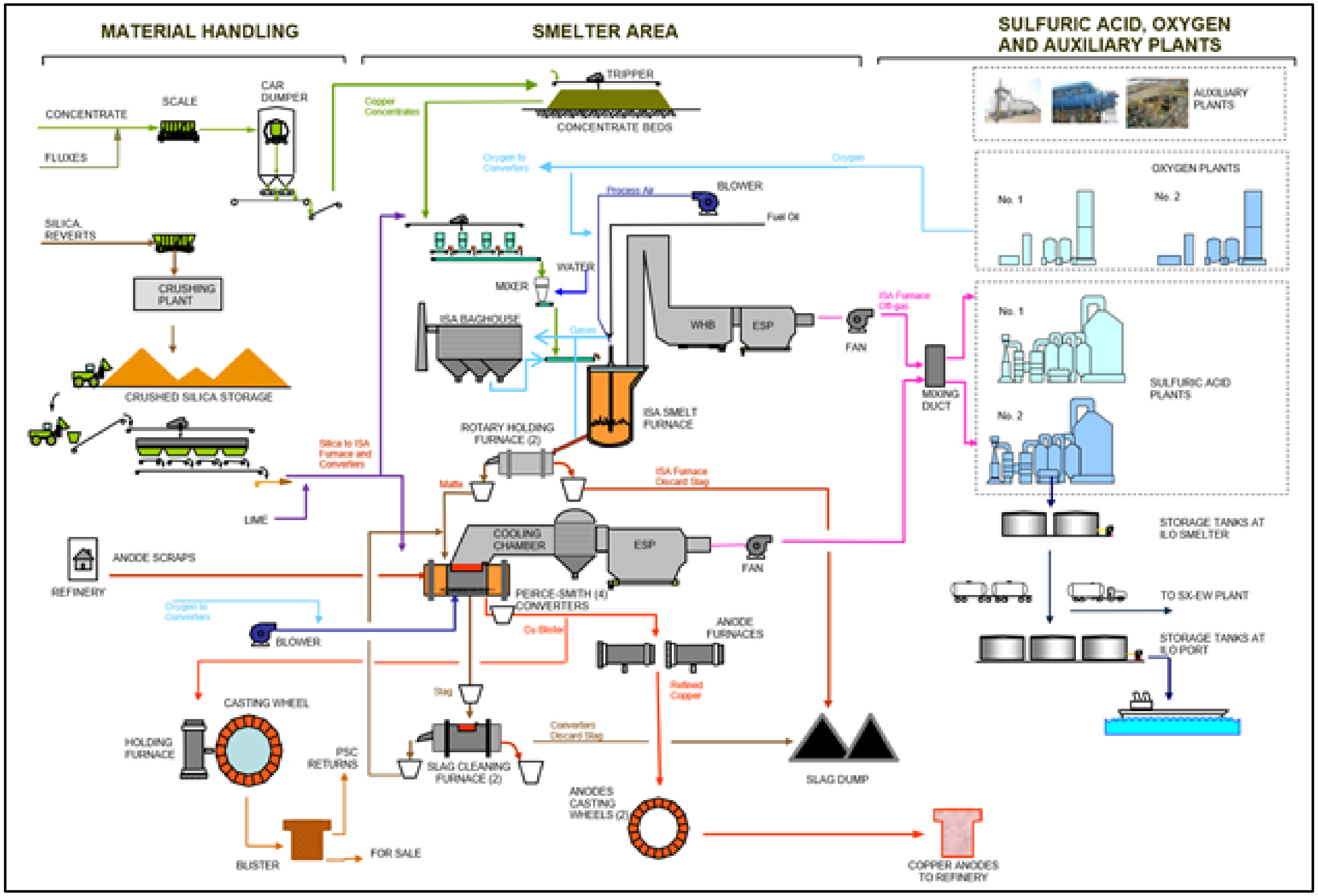
14.5.2 Flowsheet

The flowsheet for the Ilo smelter is provided in Figure 14-4.

14.5.3 Concentrate Smelting

At the smelter, the copper concentrate is mixed with silica flux before being fed to the smelting furnace. The primary smelting unit is an Isasmelt furnace which uses bath-smelting process technology. The furnace is a vertical refractory-lined vessel in which a specially-designed submerged-combustion lance is inserted into a bath of molten material. The furnace is continuously fed, through the lance, with copper concentrates and an oxygen-enriched air stream that creates vigorous agitation of the bath and rapid reaction rate.

Figure 14-4: Summary Flowsheet Ilo Smelter



(Source: Southern Copper, 2021)

The bath principally consists of molten iron–silicate slag and molten copper matte. Due to the turbulent state of the bath, the matte and slag are tapped out together periodically through a single tap hole to either of two rotary holding furnaces via water-cooled copper launders. At the RHFs the molten products are allowed to separate in a clean slag and matte molten phases that are poured separately. The rotary holding furnaces also provide surge capacity between the continuous operation of the Isasmelt furnace and the batch Peirce Smith converter cycles. Slag from the rotary holding furnaces is sent directly to the slag dump area.

The off-gas from the Isasmelt furnace, at approximately 1,050°C, is vented into a waste heat boiler where it is cooled to 350°C. Gases are then passed through a five-field electrostatic precipitator, where they are cleaned of entrained dust. Lastly, gases pass through a mixing duct and are combined with Peirce Smith converter off-gas streams before being treated in the sulfuric acid plants.

14.5.4 Matte Conversion

A 63% Cu copper matte molten phase from the rotary holding furnace vessels is treated in four Peirce Smith converters. Three Peirce Smith converters are hot while the fourth is on stand-by mode or under maintenance. At any time, a maximum of two converters are being blown.

In the converters the copper matte is oxidized in two sequential steps:

- Iron sulfides in the matte are oxidized with oxygen-enriched air and added silica, producing slag that is sent to the two slag cleaning rotary furnaces, where pig iron is used as the reducing agent.
- Copper sulfides contained in the matte are then oxidized with oxygen-enriched air to produce blister copper, containing approximately 99.3% copper.

The off-gases are diluted and collected by water cooled hoods and conducted by the gas handling system to the acid plant. The gas handling system consists of evaporative cooling chambers, a manifold, two electrostatic precipitators, fans and ductwork connecting to the mixing duct.

14.5.5 Anode Refining and Casting

The blister copper is refined in two anode furnaces by oxidation to remove sulfur with compressed air injected into the bath. Finally, the oxygen content of the molten copper is adjusted by reduction with the injection of liquefied petroleum gas with steam into the bath. Copper anodes containing approximately 99.7% copper are cast in two casting wheels and transported by railroad to the Ilo refinery located around 10 km southeast of the smelter. The smelter can also produce blister copper bars when the anode furnaces are under brick repair.

The generated gases are oxidized in an oxidation/dilution chamber, cooled, and then cleaned in a baghouse.

Typical compositions of a copper anode produced at the Ilo smelter are provided in Table 14-4.

Table 14-4: Average Chemical Composition of Anodes Produced

Cu (%)	As (ppm)	Bi (ppm)	Sb (ppm)	O_2 (ppm)	S (ppm)	Pb (ppm)	Zn (ppm)
99.74	432	101	45	888	24	81	9

14.5.6 Acid Plants

The off-gases from the smelter are treated in two acid plants (No. 1 and No. 2) to recover over 92% of the incoming sulfur, producing sulfuric acid at a concentration of 98.5%. The gas stream from the smelter with a concentration of 11.3% SO_2 is split between the two plants, both being double absorption and double contact. Approximately 16% of the produced acid is used at the Cuajone and Toquepala facilities with the balance sold to third parties.

In 2010, the Ilo smelter marine trestle started operations. This facility allows the direct loading of sulfuric acid onto ships, avoiding hauling cargo through the city of Ilo. The 500-m-long marine trestle was the last part of the Ilo smelter modernization project. Currently all overseas shipments of sulfuric acid are made using the marine trestle.

14.5.7 Oxygen Plant and Ancillary Systems

The oxygen required within the smelter processes is generated by two oxygen plants. Oxygen plant No. 1 has a capacity of 272 st/d and Plant No. 2 has a capacity 1,045 st/d.

Concentrates from Cuajone and Toquepala are relatively clean, so all the metallurgical dust generated is recycled to the Isasmelt furnace. Arsenic trioxide is added to the copper in order to meet the required quality of the anode which will allow the co-precipitation of antimony and bismuth together with arsenic during the electrorefining process at the Ilo refinery.

The smelter includes a seawater intake system, two desalination plants to provide water for the process, and an electric substation.

14.5.8 Equipment Sizing

A list of the major mechanical equipment in the Ilo smelter is presented in Table 14-5.

Table 14-5: Ilo Smelter, Major Mechanical Equipment and Operational Parameters

Function	Description	Unit	Value
Isasmelt furnace	Dimensions (height x ID)	m x m	17 x 5.5
	Capacity	t/a	1,2000,000
	Availability	%	86.5
	Target matte grade	%	63
	Oxygen enrichment	% O_2	65-70
Rotary holding furnaces	Units	number	2
	Dimensions (dia. x length)	m x m	4.7 x 15.3
	Reducing agent	—	Pig iron
	Discard slag target (Cu)	%	1.0
Peirce Smith converters	Units	number	4
	Dimensions (dia. x length)	m x m	3.96 x 10.7
	Tuyeres (number and diameter)	No. / inches	48 / 2
	Enriched air flow	Nm^3/h	46,800
	O_2 enrichment – slag blow	% O_2	24
	O_2 enrichment – copper blow	% O_2	22
Anode fire refining furnace	Units	number	2
	Dimensions (dia. x length)	m x m	4.6 x 10.7
	Capacity (each)	t	400
	Casting wheels	model	Twin M18 Outokumpu
	Capacity	t/h	100
Converter slag treatment furnace	Units	number	2
	Dimensions (dia. x length)	m x m	3.96 x 10.97
	Reducing agent, consumption	—	Pig iron
	Discard slag target	% Cu	0.9
	Sulfuric acid plant No. 1: off-gas treatment, SO_2	Nm^3/h, (%)	112,568 (12.8)
	Sulfuric acid plant No. 2: off-gas treatment, SO_2	Nm^3/h, (%)	304,580 (11.7)
	Oxygen plant No. 1 capacity	st/d	272
	Oxygen plant No. 2 capacity	st/t	1,045
	Oxygen produced, purity	% O_2	95

14.5.9 Power and Consumables

Consumptions of utilities and other consumables are expected to be similar for the LOM as seen in recent operations.

14.5.9.1 Power

The Ilo smelter currently uses power sourced from the state company Electroperu S.A, (Electroperu), a private power generator, Kallpa Generation S.A., (Kallpa) and a small portion is hydro-generated at the Cuajone facilities. Power is distributed over a 224-km closed loop transmission circuit, which is interconnected with the Peruvian electrical network.

The 2021 annual power consumption of the Ilo smelter was 342,110.2 MWh. The oxygen and acid plants accounted for around 63% of the total consumption. Power supplies are expected to be sufficient for the purposes of the LOM plan.

14.5.9.2 Water

Fresh water is required at the smelter cooling system, smelter boiler, and acid plant process. The water is supplied from seawater desalination plants.

Water supplies are expected to be sufficient for the purposes of the LOM plan.

14.5.9.3 Consumables

Consumables used in the smelter include fuel, refractory bricks, silica flux, and arsenic trioxide.

The LOM plan envisages that the same consumables will be used for the duration of the LOM plan.

14.5.10 Personnel

Personnel numbers at the Ilo smelter total 350 persons for operations and 390 persons for maintenance. Maintenance personnel provides service for both the smelter and the Ilo refinery.

14.6 Ilo Refinery

14.6.1 Overview

The Ilo refinery is located in the Pampa de Caliche at 9 km north of the city of Ilo. The original plant design was built in 1975 by Minero Perú with a treatment capacity of 150,000 t of 99.95% pure electrolytic copper cathodes per year. The plant was acquired by Southern Copper in 1994 and modernized to produce 246,000 t/a of copper cathodes. It was subsequently expanded to the current annual capacity of 294,763 t/a of copper cathodes. The Ilo refinery has the capacity to produce 125,000 kg Ag, 840 kg Au, and 50,000 kg Se annually. Although selenium, silver, gold, platinum and palladium have been historically produced as a by-product of the smelter, these metals have not been included in the mineral resource or mineral reserve estimates, and any revenues from these metals have not been recognized in the Toquepala Operations.

14.6.2 Flowsheet

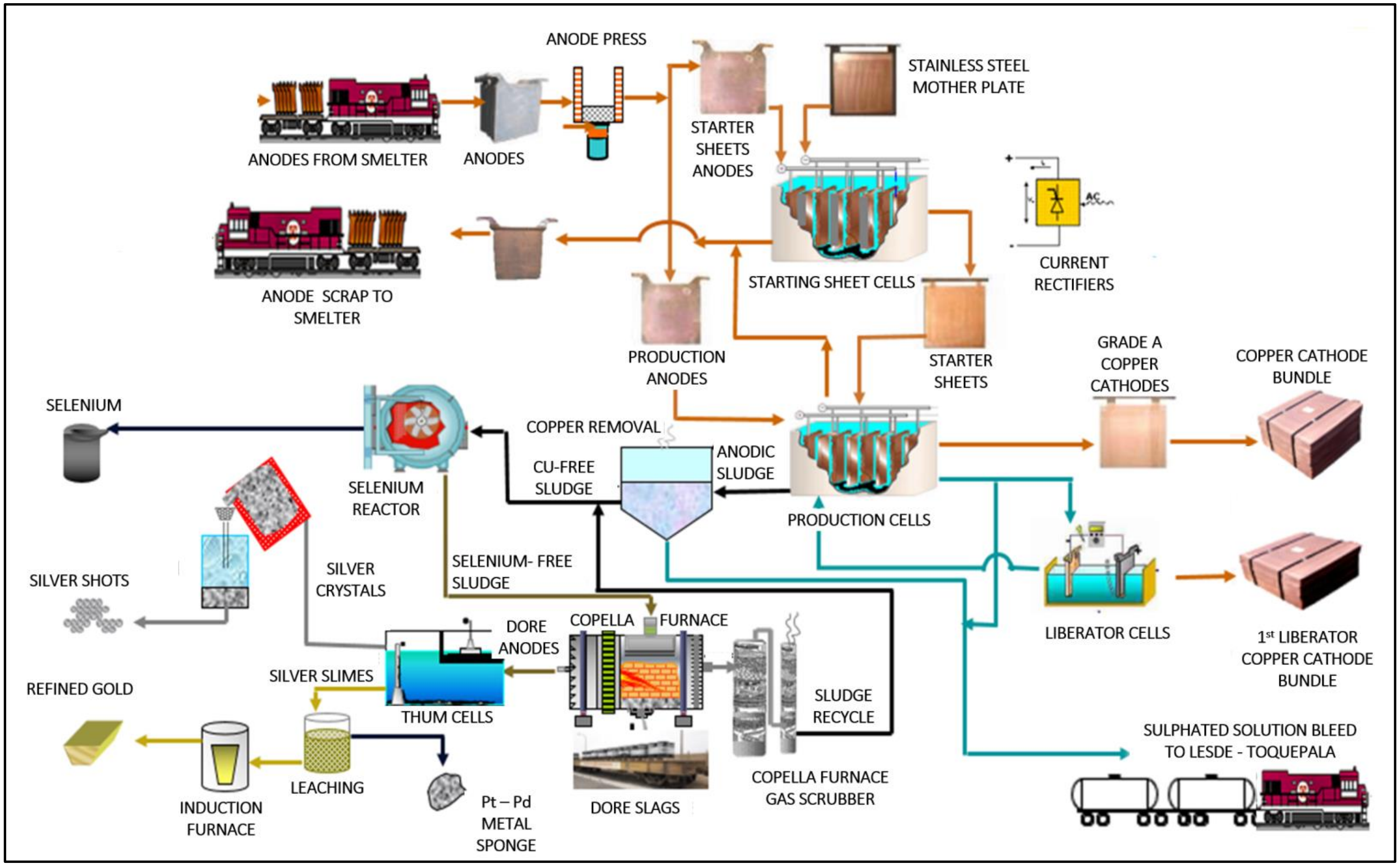
The current flowsheet is included as Figure 14-5.

14.6.3 Electrolytic Plant

The anodes produced at the Ilo smelter are transported by rail to the Ilo refinery. After unloading they are pressed to improve their shape before being loaded to the electrolytic cells. The anodes are immersed in a cell contain copper sulphate and sulfuric acid in solution which serves as the electrolyte. By the action of electrical current the copper anode dissolves in the electrolyte and deposits on a cathode surface. This process produces cathodes with a 99.99% Cu content. Impurities such as arsenic, bismuth, antimony and sulfur are not deposited on the cathode and are eliminated in the electrolyte. Other valuable impurities such as gold, silver, platinum and selenium have historically been recovered from the anode sludge in the Precious Metals plant but are not recognized as part of the revenue generated by the Toquepala Operations.

The copper cathodes are produced in 996 commercial electrowinning cells including 52 starter cells in which starter cathode sheets are produced. Each commercial cell is loaded with 52 anodes of 435 kg and 53 starter cathodes of 7 kg. At the end of the electrorefining cycle, the cathodes are removed from the cells and rinsed in three stages: agitated hot water, high pressure hot water, and vapor rinse to eliminate sulfates from the surface of the cathodes.

Figure 14-5: Summary Flowsheet Ilo Refinery



(Source: Southern Copper, 2021)

Corroded anodes are rinsed at the end of the refining cycle using condensed hot water. Around 14% in weight of the total copper in anodes arriving at the refinery is returned to the smelter for recycling as corroded anodes.

In order to control the concentration of dissolved copper, a portion of the electrolyte is treated in the electrolytic liberator cells where insoluble anodes are used to produce cathodes of 99.99 %Cu.

The anodic sludge produced in the electrolytic cells is received in settling tanks to separate it from the electrolyte, and then leached in oxidation tanks for 24 h at 80°C with an aerated diluted acid solution to dissolve entrapped copper in the sludge. Copper-free sludge is then washed and centrifuged to obtain commercial anodic sludge with a moisture content of<14% and copper content of <2%. The commercial sludge is then sent to the precious metals plant for the recovery of silver, gold, selenium and small amounts of platinum and palladium.

To maintain the balance of impurities in the electrolyte, the resulting leach solution from the anodic sludge leaching is sent by rail to the Toquepala leaching plant.

The copper cathode production for 2020 was 286,275 t with an average chemical composition as indicated in Table 14-6. The LOM cathode composition is expected to be similar to that shown.

Table 14-6: Average Cathode Chemical Composition (2020)

Cu (%)	Ag (ppm)	Se (ppm)	Ni (ppm)	Pb (ppm)	Fe (ppm)	S (ppm)	Bi (ppm)	Sb (ppm)	As (ppm)	Te (ppb)	Zn (ppm)
99.998	10	0.01	0.01	0.01	0.01	5	0.01	0.01	0.01	0.01	0.01

14.6.4 Precious Metals Plant

The commercial anodic sludge is processed at the precious metals plant, with oxygen and sulfur dioxide, in an electric roaster oven to produce commercial selenium with a purity of 99.5%. Selenium-free sludge is then melted in a Copella furnace to produce doré anodes.

The doré anodes are placed on Thum cells for electro-refining, producing silver crystals and slimes. Produced silver crystals, with a purity of 99.99%, are melted in an induction furnace to generate commercial silver shot as a final product. The silver slime undergoes an acid digestion process to obtain gold dust that is then smelted to produce 99.99% pure gold bullion.

14.6.5 Equipment Sizing

The major mechanical equipment in the Ilo refinery is summarized in Table 14-7.

Table 14-7: Ilo Refinery Major Mechanical Equipment and Design Parameters

Area	Description	Unit	Value
Anodes	Commercial anode weight (per unit)	kg	435
	Commercial anode area (avg.)	m^2	0.855
	Stripper anode weight (per unit)	kg	445
	Dissolved anodes	t/d	810
	Composition: copper	%	>99.6
	Composition: oxygen	ppm	500–1,300
	Composition: sulphur	ppm	<45
	Composition: arsenic	ppm	280–550
Electrowinning cells – commercial and starter sheets	Number of cells	units	996
	Anodes per cell	units	52
	Cathodes per cell	units	53
	Cathode starting weight	kg	7
	Electrolyte flow per cell	L/min	25
	Electrolyte total flow	m^3/h	1494
	Current intensity	A	29,400
	Current density	A/m^2	277
	Current efficiency	%	97.5
Liberator electrowinning cells	Number of cells	units	24
	Electrolyte flow per cell	L/min	25
	Electrolyte total flow	m^3/h	60
	Current intensity	A	14,500
	Current density	A/m^2	137
	Current efficiency	%	95
Electrolyte composition	Copper	g/L	41–45
	Sulfuric acid	g/L	167–173
	Arsenic	g/L	7.5–10.5
	Antimony	g/L	≤0.45
	Bismuth	g/L	≤0.4

Area	Description	Unit	Value
Cathode production and composition	Copper cathodes	t/a	294,763
	Cathode weight per unit	kg	180 ± 30
	Cathode length x width	m x m	1.02 x 1.02
	Copper	%	>99.99
	Silver	ppm	<20
	Sulfur	ppm	<10
Precious metals plant	Sludge treated	t/a	460
	Sludge composition: copper	%	<2.5
	Sludge composition: moisture	%	≤14.5
	Selenium electric oven – capacity	t/h	2.6
	Copella oven – capacity	dry t/batch	10.2
	Silver refining cells	Units	27
	Silver refining cells current density	A	150
IDE Aquaport desalination plant		m^3/d	1,000
Steam system	Gonella	t/h	20
	Cleaver & Brooks	t/h	20
Rectifier commercial cells	Westinghouse (450 VDC)	KA	2 x 15
	Friem (460 VDC)	KA	2 x 20
Rectifier liberator cells	Friem (120 VDC)	KA	2 x 20

14.6.6 Power and Consumables

14.6.6.1 Power

The Ilo refinery uses the same power sources and network as outlined in Chapter 14.5.9.1. LOM requirements are estimated at an average 95 MW/a. The majority of the power requirement is from the electrolytic plant.

For 2021, the annual power consumption in the Ilo refinery was 91,281.96 MWh, and the electrolytic plant accounted for around 89% of the total consumption.

There is sufficient power capacity available to support the LOM plan.

14.6.6.2 Water

All water consumed in the Ilo refinery is desalinated seawater. For this purpose, the refinery has a desalination plant with a nominal capacity of 1,000 m^3 of treated water per day.

Water supplies are expected to be sufficient for the purposes of the LOM plan. Water consumption is expected to be in line with previous operating experience.

14.6.6.3 Consumables

Consumables used in the refinery include animal glue, thiourea, hydrochloric acid, and sulfuric acid. The precious metals plant uses diesel, sodium carbonate, sodium nitrate, borax, calcium carbonate, anthracite, nitric acid, hydrochloric acid, sulfur dioxide, and oxygen.

The LOM plan envisages that the same consumables will be used for the duration of the LOM plan.

14.6.7 Personnel

The personnel count for the Ilo refinery totals 218 persons for operations and 385 persons for maintenance. Maintenance personnel provides service for both the refinery and the Ilo smelter.

15.0 INFRASTRUCTURE

15.1 Introduction

On-site infrastructure that supports the Toquepala Operations include:

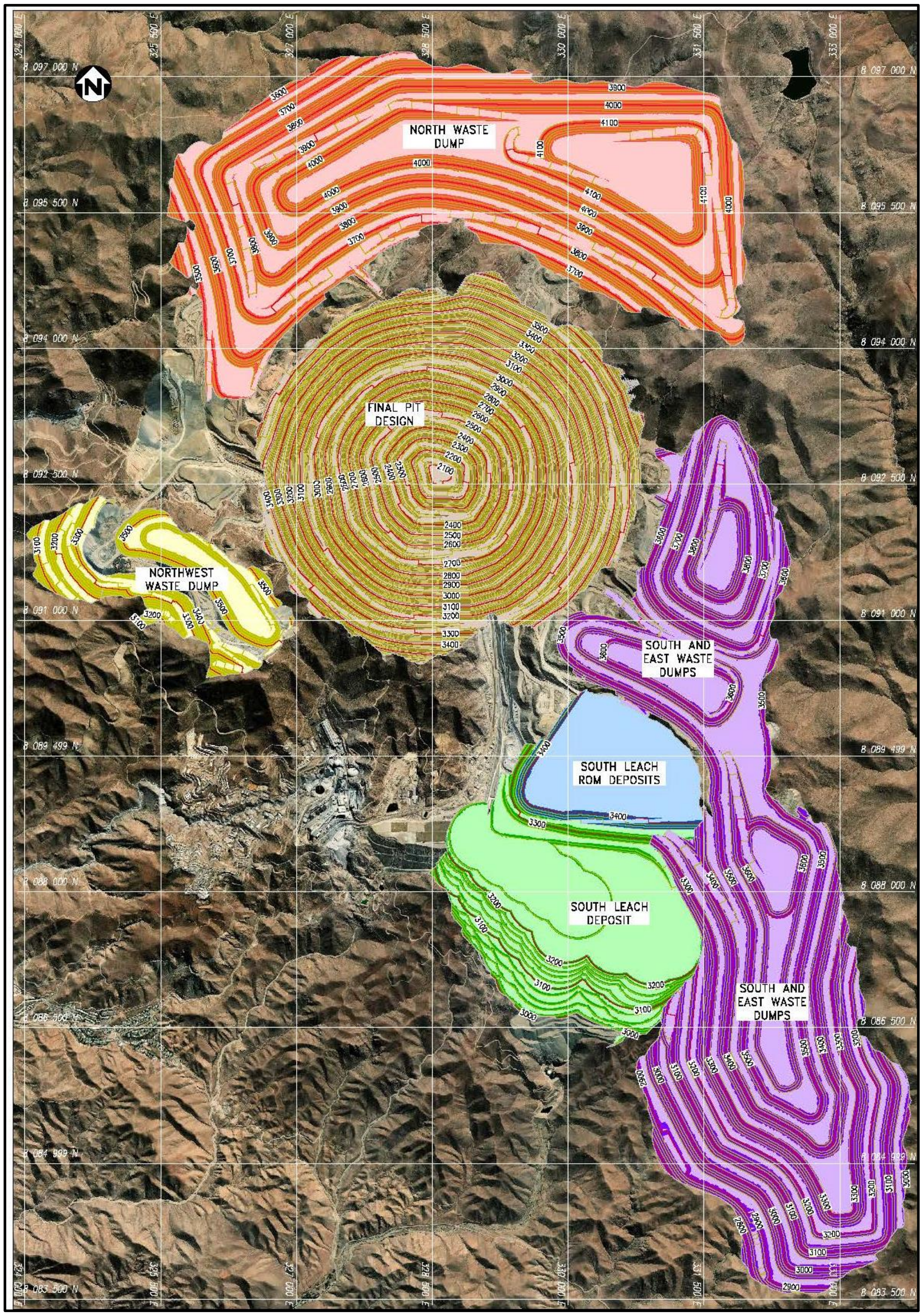
- One open pit
- Four waste rock storage facilities (WRSFs)
- Two coarse (crushed) ore stockpiles
- Two low-grade sulfide leach dumps (one crushed and one ROM)
- Process facilities, including concentrators and LESDE plants, conveyor systems
- Warehouses, workshops, and offices
- 138 kV and 220 kV power transmission lines
- Electrical substation and power distribution system
- Water handling facilities
- Permanent camp for operations
- Railway and rail yard.

Off-site infrastructure includes:

- Access road
- 138 kV and 220 kV power transmission lines
- Electrical substations and power distribution systems
- Railway
- Quebrada Honda TSF
- Water supply system
- Smelter, refinery and sulfuric acid plants in Ilo
- Port facilities in Ilo including dock and storage areas, rail yard, and wagon repair shop
- Port facilities in Tablones, where hydrocarbons and sulfuric acid are unloaded and sent to the mine site
- Simón railway yard, which has assembly and dispatch areas, as well as workshops and offices.

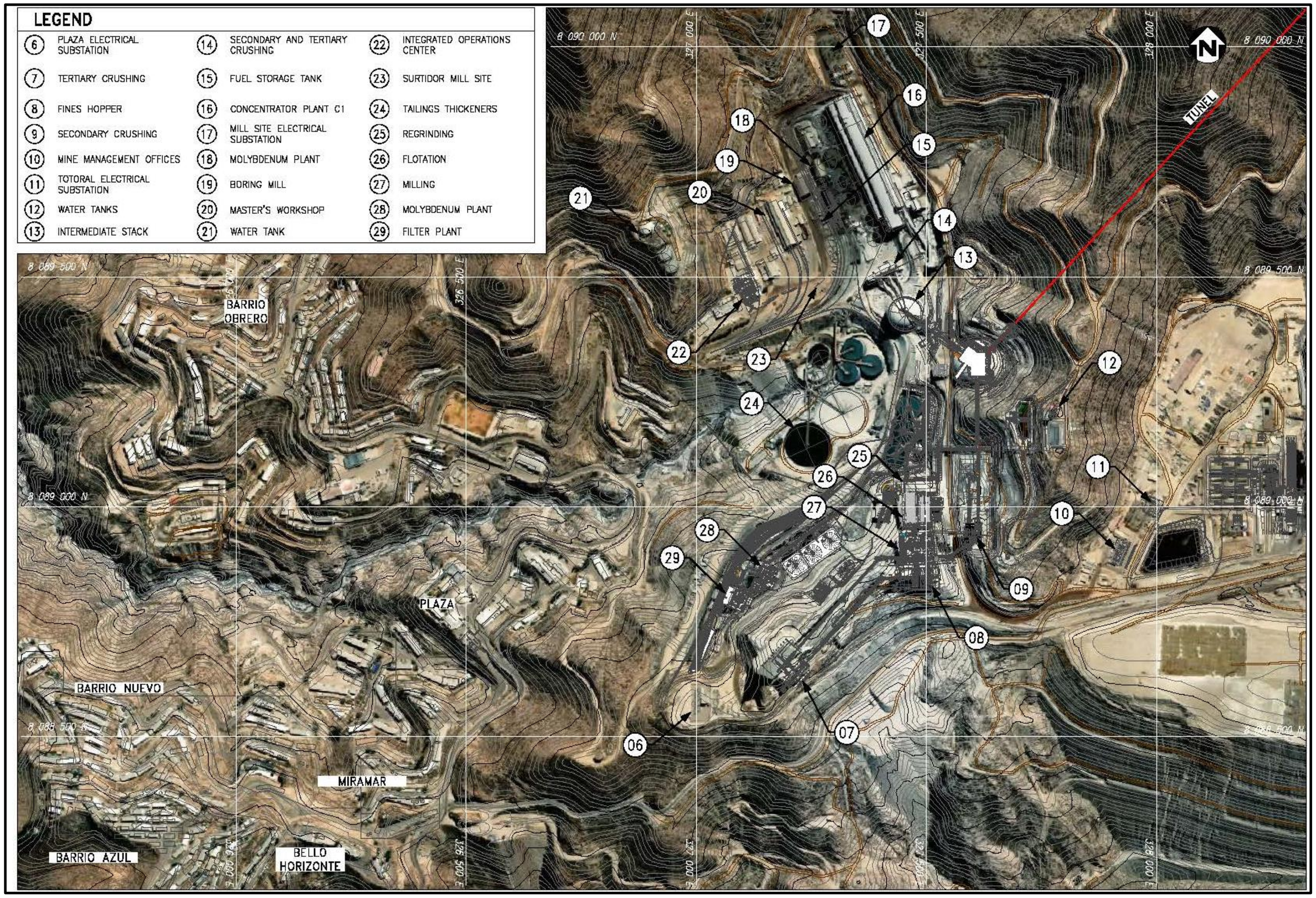
A layout plan showing the final design configuration of the open pit and the WRSFs is shown in Figure 15-1. Figure 15-2 shows the infrastructure related to the process plant. Figure 15-3 provides the locations of infrastructure situated along the railway line between the open pit and the process plant. Figure 15-4 is a plan showing the accommodations facilities.

Figure 15-1: Final Design Configuration Open Pit and WRSF Layout Plan



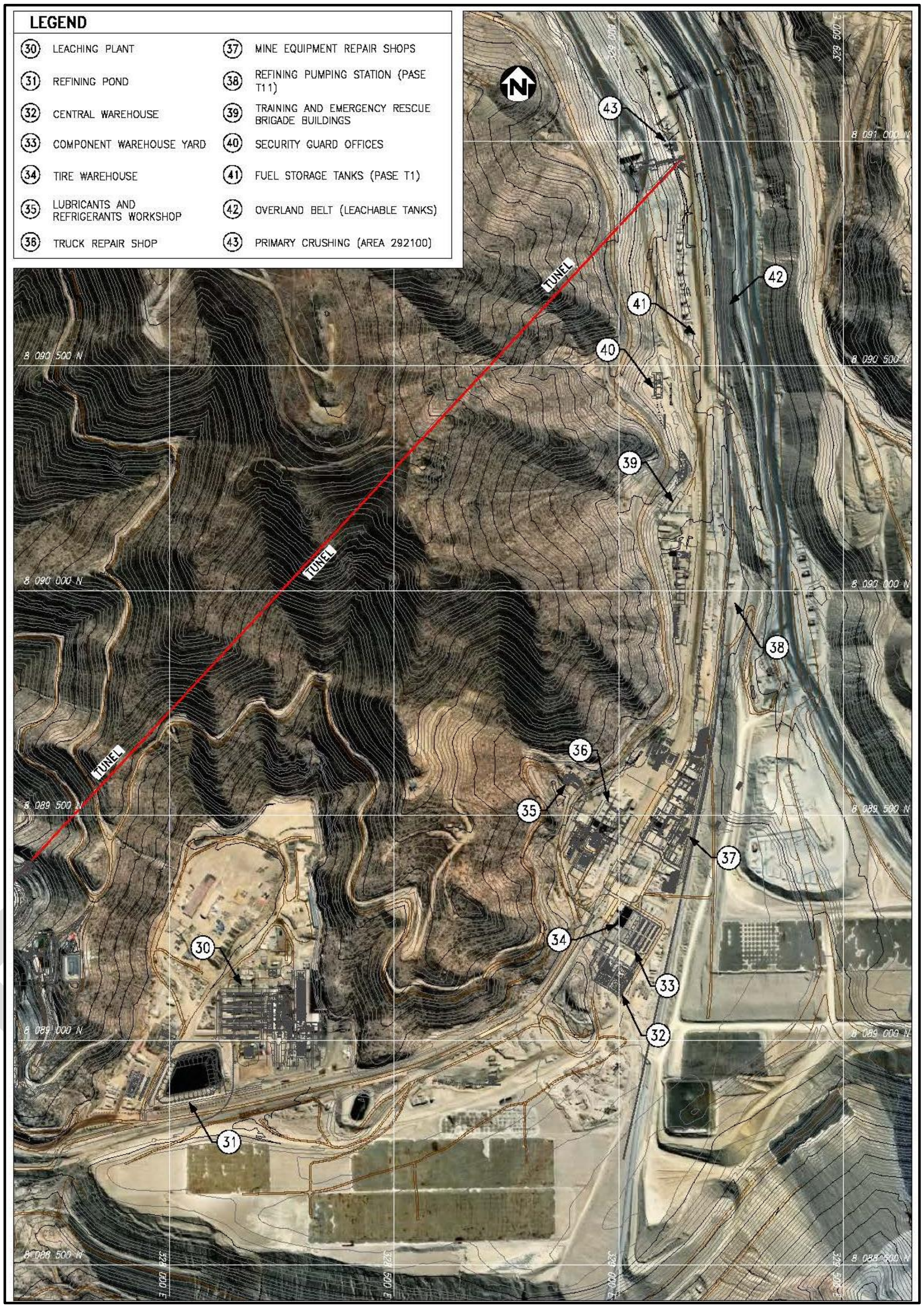
(Source: Wood, 2021)

Figure 15-2: Plant Site Infrastructure



(Source: Wood, 2021). Note: Tunel = tunnel

Figure 15-3: Infrastructure Along Railway Line, Between Plant and Open Pit



(Source: Wood, 2021). Note: Tunel = tunnel

Figure 15-4: Accommodation Infrastructure

(Source: Wood, 2021). Note: Losa deportiva = sports court; Casa huespedes = guests house; Cancha tenis = tennis court

15.2 Roads and Logistics

The Toquepala and Cuajone Operations, together with the Ilo smelter and refinery, are connected by a network of public roads and a private railway operated by Southern Copper.

15.2.1 Roads

The Toquepala Operations are accessed from the city of Tacna via the Pan-American South Highway PE-1S to the town of Alto Camiara. Departmental roads TA-100, MO-107 and TA-105 are followed to the junction with the mine access road.

Personnel are transported to the mine site from the Villa Cuajone and Villa Botiflaca camps.

The TSF at Quebrada Honda is situated 40 km southwest of the Toquepala Operations. It is accessed via the departmental road TA-100 and MO-107 from the town of Alto Camiara.

15.2.2 Rail

Railways extend from Ilo to Toquepala, and a spur railway runs from the Toquepala Operations to the Cuajone Operations. Supplies such as sulfuric acid, equipment, fuel, and mining supplies are transported to the operations using the rail network. Concentrates are railed from the mine site to the Ilo smelter/refinery, and cathodes produced at the refinery are railed to the Port of Ilo.

Within the Toquepala Operations area, branch lines extend from the pit to the leach pads and the concentrator. Trains are used to transport high-grade ore to the crusher at the concentrator, and leachable ores to the leach pads. There are two rail yards, one located at the mill site, and the second at the concentrator.

Light rail equipment maintenance facilities are located near the concentrator. A railway yard that supports both the Toquepala and Cuajone operations is located at Botiflaca, and provides maintenance facilities for light rail equipment and locomotives. In addition, the yard is used to assemble and dispatch of trains from the mill site and Botiflaca areas and has offices for train operations and track maintenance staff.

The Simón rail yard near the Port of Ilo includes train assembly yard and train dispatch areas, balance-weighing of concentrates, anodes, blister, cathodes and loads, one diesel fuel tank for refueling locomotives, a locomotive workshop, and a train operations office.

15.2.3 Port

The Port of Ilo is a private port, operated by Southern Copper. It has two berths, and can take vessels to 40,000 deadweight. The port is the export point for copper cathodes, copper concentrate, sulfuric acid and molybdenum; and the import location for general containerized and loose cargo to support operations. Supporting the port is a 182 m-long pier, breakwater, offices storage terminals, warehouses and laydown areas, storage tanks and pipelines, spill containment infrastructure, enclosure fencing, and an operations control center.

The Tablones port terminal is located 15 km north of the Port of Ilo, and consists of two facilities:

- Marine trestle facility used to load sulphuric acid. The facility can accommodate a ship mooring capacity of up to 37,000 tonnes deadweight, and is 11 m deep and 180 m long.
- Multiple buoy facility used to unload hydrocarbons. The facility can accommodate a tanker mooring capacity of up to 70,000 tonnes deadweight, and is 13 m deep and has a submarine pipeline that is 600 m long.

Supporting the port is an access road; enclosure fencing; a marine rock wall; an electrical power system that supplies 13.8 kV; spill containment infrastructure; hoses, pipes and cranes for product loading; mechanical equipment including plant and instrumentation air; and an operations control center.

15.3 Stockpiles

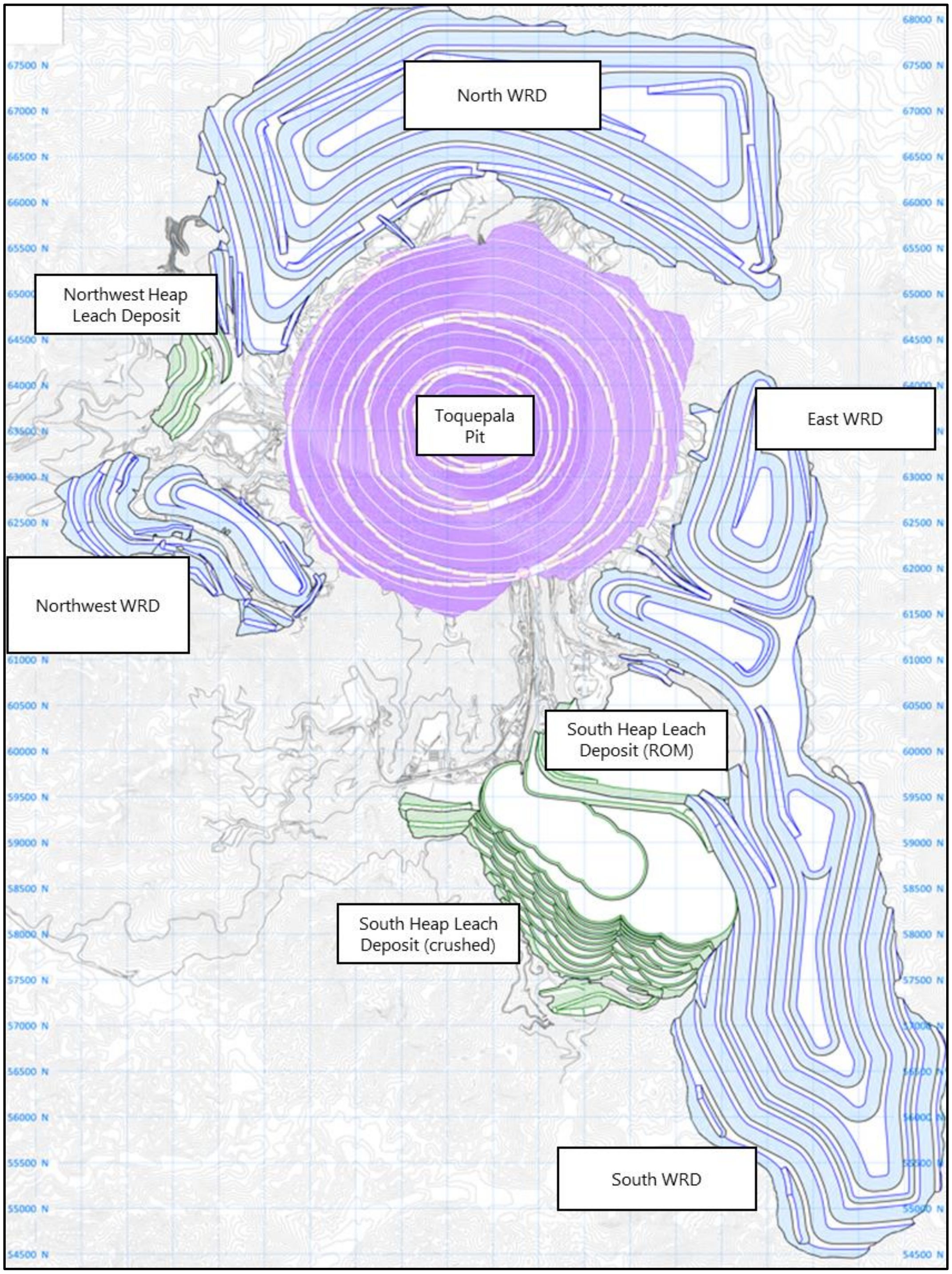
There are two coarse ore stockpiles, used for temporary storage, that feed Toquepala concentrators C1 and C2, respectively.

15.4 Waste Rock Storage Facilities

Figure 15-5 shows the locations of the four waste rock storage facilities (WRSFs) on the property. The facilities are described in Chapter 13.4.4. Three facilities are currently in use, and the fourth is anticipated to be constructed by the end of 2031 for use throughout the remaining mine life. There is sufficient capacity in the WRSFs for LOM requirements.

Portions of the waste rock storage facilities (WRSFs) required for the LOM plan are outside the current area of surface rights held by Southern Copper, and additional surface rights will need to be secured (see Chapter 17.4).

Figure 15-5: Heap Leach Facility and WRSF Layout Plan



(Source: Southern Copper, 2021). Note: WRD = waste rock storage facility

15.5 Tailings Storage Facilities

The Quebrada Honda TSF is the repository for tailings from the Toquepala and Cuajone Operations. It is situated southwest of the Toquepala Operations and south of the Cuajone Operations. Tailings deposition commenced in December 1996. When built, the facility is designed to have a total ultimate capacity of 2,347 Mt. The remaining capacity is about 1,000 Mt, which is sufficient to support approximately 14 years of production, from 2023–2036, based on the current production rates at the Toquepala and Cuajone Operations.

The TSF operates as a cross-valley impoundment and is confined by two dams constructed of compacted cyclone tailings sand. Among them, the main dam, located southwest of the impoundment, is being raised with the downstream construction method; and the lateral dam, located southeast of the impoundment is being raised with the center-line construction method. Tailings are discharged into the impoundment via steel and HDPE pipelines, and the resulting cyclone tailings sand is spread out over the cell using graders. The tailings sand of tailings dams is further flattened using vibratory smooth rollers to achieve compacted tailings zones. The tailings supernatant pool is located at the north end of the impoundment away from the two dams where water is reclaimed and transported back to the process plant.

Additional tailings storage capacity will be required after approximately the end of 2036, see discussion in Chapter 18.2.1.

The former Ite tailings disposal area was located on a narrow coastal plain in southern Peru, approximately 50 km southwest of the port of Ilo. Tailings from Toquepala and Cuajone process plants were discharged into Ite Bay from 1959–1996. The Plan for Environmental Management and Adjustment (PAMA in the Spanish acronym) was completed in 1997 and covers rehabilitation.

15.6 Water Management Structures

The Toquepala mine is in a dry area with minor rainfall and surface runoff during the months of January to March. The surface drainage system, consisting of channels, ditches, retention ponds, evaporation ponds, and storage ponds, is used to divert rainwater away from the open pit and WRSFs.

The stormwater management system includes two collection ponds located to the north of the open pit, which are designed to retain a probable maximum precipitation event from the Andean sector of the pit. This system also catches contact water from the coarse stockpile and the waste rock storage facilities. Contact water captured by the dikes is sent to a storage pond and is used for dust mitigation along the roadways.

No water is discharged from the operations as no mining effluents are generated at the mine site. At Quebrada Honda, Southern Copper is authorized to dispose of decanted water from the tailings.

Water from the TSF is used in the process plant following treatment in a neutralization facility.

15.7 Built Infrastructure

In general, the Toquepala mine have the necessary facilities to carry out its current operations. Costs have been included as part of the capital and operating cost estimates to account for that additional infrastructure that will be required later in the LOM to support the proposed mine production schedule at current production throughputs, and include the following:

- Truckshop expansion to serve increased mining equipment fleet
- Waste dumps development
- Existing tailings storage facility (Quebrada Honda) raise
- Filtering tailings plant and land acquisition for tailings management. It has been assumed that, once the existing Quebrada Honda TSF reaches the ultimate storage capacity by approximately the end of 2036, the Toquepala Operations will dispose filtered tailings in a standalone dry stack facility to be located near the Quebrada Honda TSF area, as limited space is available on the Toquepala site. Southern Copper is of the opinion that the company will have sufficient time to complete the designs and permit for this facility.
- Primary crusher relocation.

15.8 Camps and Accommodation

Collectively, the Toquepala and Cuajone Operations, together with the Ilo smelter/refinery complex, have five accommodations areas, which provide a permanent accommodation capacity of 4,756 persons. Temporary modular accommodation has the capacity to house an additional 946 personnel.

The Toquepala Operations have two accommodation/village areas, referred to as Villa Staff and Residential Plaza, situated to the southwest of the open pit. Plaza houses approximately 1,000 workers and their families and Villa Staff houses around 200 workers and their families. These villages have lodging facilities, medical and hospital support, a central food facility, recreational facilities, educational centers, churches, and grocery and household retail stores. A small airport is located adjacent the Villa Staff village.

15.9 Power and Electrical

The energy supply for the Toquepala Operations comes from the National Interconnected Electric System (SEIN), primarily from natural gas-fired thermal power plants located in the Chilca–Lima district of Perú and the Puerto Bravo plant located in Mollendo, and from the Antunez de Mayolo and Cerro del Aguila hydroelectric power plants.

Power is transmitted to the Southern Copper facilities in transmission networks of 500, 220 and 138 kV, using two Southern Copper-owned transmission lines of 138 kV (225 km long) and 220 kV (240 km long).

At each facility, power is stepped down using a series of sub-stations and distributed to the areas and equipment requiring electricity. At the mine site, the Plaza substation (138/23 kV) has two 80 MVA transformers, one which is operating, and the second located near the concentrator. The transformers step down the voltage to the levels required for mine site usage.

Southern Copper has an energy supply contract with the companies Kallpa and Electroperú and a maintenance contract for the transmission lines owned by Southern Copper and the main substations that are reported to Peru's *power* grid coordinator, Comité de Operación Económica del Sistema Interconectado Nacional (COES).

Electro Integra was retained to prepare a "Master Plan for Energy of the Three Operating Areas of Southern Copper" (the Toquepala and Cuajone Operations and the Ilo smelting/refining complex) to guarantee the energy supply for current operations and to establish competitive energy costs. Southern Copper has developed a "Comprehensive Plan to Address Power Cuts in the Southern Copper System" to address potential future brownouts or power losses from the national grid.

15.10 Water Supply

Fresh water for the mine and process facilities is obtained from both ground and surface sources:

- Huaitire and Vizcachas groundwater wells
- Suches lagoon
- Tacalaya and Honda streams

Water is transported by a network of pipelines to the operations, where it is stored in the Pampa de Vaca reservoir, located approximately 6 km northeast of the Toquepala mine. The reservoir has a storage capacity of 1.6 Mm^3, sufficient for 12 days operation in the event of an interruption in the upstream pipeline system.

A 10.2 km long steel pipeline is used to pump water from Quebrada Honda TSF to the process plant.

16.0 MARKET STUDIES

16.1 Markets

16.1.1 Copper

Copper futures are exchange-traded contracts on all of the world's major commodity exchanges. Copper is the world's third most widely used metal after iron and aluminum and is primarily consumed in industries such as construction and industrial machinery manufacturing.

The Toquepala Operations produce copper concentrates and copper cathodes.

Southern Copper provided Wood with an overview of the copper market as sourced from third-party experts, Wood Mackenzie, which was dated June, 2021. The report provided information on the copper market out to 2040, and covered information such as copper price forecasts, scenario modeling, demand in detail, and supply in detail.

These data support that there is a reasonable basis to assume that there is a reasonably accessible market for the key mine products and that they will be saleable at the assumed commodity pricing used in the LOM plan.

16.1.2 Molybdenum

Molybdenum is mainly used as an alloying agent in stainless steel, and also in the manufacture of aircraft parts and industrial motors. The biggest producers of the metal are: China, United States, Chile, Peru and Mexico. Molybdenum futures are available for trading in The London Metal Exchange (LME). Prices are generally determined by principal-to-principal negotiations between producers, trading houses, and end users.

The Toquepala Operations produce molybdenum concentrates.

16.1.3 Gold and Silver

Gold and silver are sold as contained in the copper concentrate and not as a separate product from the mine. No recognition of revenues from gold and silver are made in the mine plan or the economic analysis in this Report as these metals have not been included in the mineral resource and mineral reserve estimates.

16.2 Market Strategy

Southern Copper employs a corporate strategy that is in line with the company's marketing experience, and experience with obtaining long-term contracts with strategic business partners in the Asian and European markets, as well as annual contracts with other active market participants.

Normally over 60% of the molybdenum concentrate is sold to Chile, with the remainder sold into the Northern Europe, Asia and the US markets.

Cathode copper is sold onto the Asian, European, Brazilian and/or North American markets.

16.3 Product Marketability, Toquepala Operations

The principal product specifications require copper concentrates to be free from radioactivity. Deleterious impurities harmful to smelting and/or refining processes, are based on the China Inspection and Quarantine Services limit specifications for the import of copper concentrates into China as follows:

- Pb: ≤6.0%
- As: ≤0.5%
- F: ≤0.1%
- Cd: ≤0.05%
- Hg: ≤0.01%.

The principal payable commodities within the concentrates from the Toquepala Operations are copper and molybdenum. Although gold and silver exists as a by-product in the concentrate, no recognition of revenue from gold and silver is made in this Report because these metals have not been included in the mineral resource or mineral reserve estimates.

16.4 Product Marketability, Ilo Smelter

The cathodes, anodes, and by-products produced at the Ilo smelter and refinery are considered by Southern Copper to be readily marketable. The principal payable commodities are copper, silver, and gold.

16.5 Commodity Pricing

Southern Copper provided Wood with Southern Copper's internal metal price forecast and a presentation on their market outlook in the form of a slide deck. The commodity price forecast covered the period 2022-2026 and provided a long-term forecast for 2026 onward. Forecasts were based on Southern Copper's interpretations of market analysis from Wood Mackenzie, CRU and 23 analysts and banks on copper price, and six analysts and banks on molybdenum price.

Wood reviewed the Southern Copper long-term forecast price for copper of US$3.30/lb over the life of mine, and concluded that the copper price selected by Southern Copper is reasonable in comparison to the prices being used by Southern Copper's industry peers.

It is industry-accepted industry practice to use higher metal prices for the mineral resource estimates than the pricing used for mineral reserves. The higher metal prices used for mineral resources helps ensure that the mineral reserves are a sub-set of the mineral resources. The long-term copper price forecast of US$3.30/lb for mineral reserves was increased by 15% to provide the mineral resource estimate copper price of US$3.80/lb which was fixed over the 50 year life of mine.

Wood reviewed the Southern Copper long-term forecast price for molybdenum of US$10.00/lb over the life of mine and concluded that the molybdenum price selected by Southern Copper is reasonable compared to what others have recently been using in the industry. The Southern Copper molybdenum price forecast of US$10.00/lb was increased by 15% to US$11.50/lb to provide the input to the mineral resource constraining pit shell and NSR cut-off and fixed over the 50 year life of mine.

The fixed metal price forecasts used are:

- Mineral resources
  - Copper: US$3.80/lb
  - Molybdenum: US$11.50/lb
- Mineral reserves:
  - Copper: US$3.30/lb
  - Molybdenum: US$10.00/lb.

Cashflows use the same metal price assumptions as were used for the mineral reserves and are fixed over the life of mine.

The assumed exchange rate for cashflow analysis purposes was US$1.00 = PENS/3.81. This exchange rate was provided by Southern Copper.

16.6 Contracts

Toquepala Operations concentrates are sent to the Ilo Smelter and Refinery for processing to produce refined cathodes. When the production from Toquepala and Cuajone Operations exceeds the smelter's capacity, a portion is sold to third parties. In recent years, these third-party sales of Toquepala and Cuajone Operations concentrates have represented about 20–25% of the annual production. Approximately 95% of the production of refined cathodes is sold under annual contracts with industrial customers (mainly copper rod producers), with whom Southern Copper has had a commercial relationship for many years, and about 5% is sold on the spot market.

The largest in-place contracts other than for product sales cover items such as bulk commodities, operational and technical services, mining and process equipment, and administrative support services. Contracts are negotiated and renewed as needed.

17.0 ENVIRONMENTAL STUDIES, PERMITTING, AND PLANS, NEGOTIATIONS, OR AGREEMENTS WITH LOCAL INDIVIDUALS OR GROUPS

17.1 Baseline and Supporting Studies

Baseline studies were done prior to mine start-up, and included assessments of air quality, noise, vibrations, water and sediment quality, flora and fauna surveys, and the human environment, including archaeological surveys. The data collected were used in support of the Environmental Impact Assessment (EIA).

The EIA included an environmental management plan to mitigate potential impacts on water quality, biological resources, archaeological resources, and socioeconomics. The EIA was supported by supplemental technical reports that identified updated technologies and modifications to be implemented to complement actions identified in the original environmental management plan.

Requirements and plans for:

- Waste disposal are described in Chapter 15.4.
- Tailings disposal are described in Chapters 15.5 and 18.2.1.
- Water management are described in Chapters 13.3 and 15.6.

17.2 Environmental Considerations/Monitoring Programs

As per permit requirements, Southern Copper has a number of monitoring programs in place, and monitors ground water, air quality, noise and biology in accordance with the commitments made in the Environmental Management and Adjustment Plan, Environmental Impact Study, Closure Plans and updates to those plans and studies.

Southern Copper has approval to discharge 98 L/s of treated industrial water from the Quebrada Honda TSF to the Locumba River. The mine must monitor the water being discharged, and the river water quality every three months, under Directorial Resolution (R.D.) N° 190-2018-ANA-DCERH (26/11/2018).

17.3 Closure and Reclamation Considerations

Mine closure measures were developed in accordance with the Toquepala Mine Closure Plan Modification, approved under Directorial Resolution R.D. N° 079-2016-MEM-DGAAM. An updated Mine Closure Plan is under MINEM evaluation.

Closure plans cover temporary, progressive, and final closure stages, and post-closure maintenance and monitoring. The overall objective is to ensure that the final configuration of the facilities at closure is physically, chemically, and hydrologically stable over the long term.

Closure costs are included in the mine site financial model as cash costs on an annual basis. The current closure plan was completed in January 2022, and cost estimates were escalated to Q3 2022 for this assessment. The current closure cost estimate for the Toquepala Operations, as at Q3 2022, is US$196.5 million, including general sales tax.

For this assessment, the Quebrada Honda TSF closure costs and the Ilo Smelter and Refinery closure costs were allocated to the Cuajone and Toquepala Operations proportionally to nominal mill feed throughputs of each and the total LOM concentrate fed by each mine, respectively. The Ilo Smelter and Refinery closure cost was prepared in 2018, and was escalated to Q3 2022 for this assessment. A provision of US$100.1 million, including general sales tax, was included to account for the closure cost of the standalone filtered tailings plant and dry-stack tailings facility assumed. The total closure cost estimate assumed in the economic analysis is US$355.7 million. The estimate is inclusive of the Peruvian general sales tax.

The closure costs include:

- Progressive closure: US$42.9 million
- Final closure: US$145.9 million
- Post closure: US$7.7 million
- Proportional costs Quebrada Honda TSF: US$14.8 million
- Dry-stack tailings: US$100.1 million
- Proportional costs Ilo Smelter and Refinery: US$44.3 million.

17.4 Permitting

17.4.1 Current Operations

The Toquepala Operations and the Ilo Smelter and Refinery have all of the required permits to operate (Table 17-1 and Table 17-2).

Table 17-1: Key Permits, Toquepala Operations

Permit Number	Permit	Date Issued	Permit Authority
Environmental			
Report N° 354-95-EM-DGM/DPDM	EIA of the Cuajone-Toquepala Integrated Leaching Project	August 4, 1995	Ministry of Energy and Mines/General Mining Directorate
R.D. N° 042-97-EM/DGM	Environmental Management and Adaptation Program	January 31, 1997	Ministry of Energy and Mines/General Mining Directorate
Report N° 660-98-EM-DGM/DPDM	EIA of the SX/EW Tank House-Plant Expansion Project	November 10, 1998	Ministry of Energy and Mines/General Mining Directorate
Report N° 147-99-EM-DGM/DPDM	EIA Leaching of the Northwest Dumps	March 13, 1999	Ministry of Energy and Mines/General Mining Directorate
R.D. N° 339-2001-EM/DGAA	Modification of the Environmental Management and Adaptation Program	October 26, 2001	Ministry of Energy and Mines/General Directorate of Mining Environmental Affairs
R.D. N° 333-2009-MEM/AAM	U.P. Mine Closure Plan Toquepala	October 23, 2009	Ministry of Energy and Mines/General Directorate of Mining Environmental Affairs
R.D. N° 052-2013-MEM/AAM	First Update of the U.P. Mine Closure Plan. Toquepala	February 20, 2013	Ministry of Energy and Mines// General Directorate of Mining Environmental Affairs
R.D. N° 611-2014-MEM/DGAAM	EIA of the Toquepala Concentrator Expansion and Quebrada Honda Tailings Reservoir Expansion project (ERQH)	December 17, 2014	Ministry of Energy and Mines/General Directorate for Mining Environmental Affairs
R.D. N° 079-2016-MEM-DGAAM	Modification of the Mine Closure Plan of the Toquepala mining unit	March 16, 2016	Ministry of Energy and Mines/General Directorate of Mining Environmental Affairs

Permit Number	Permit	Date Issued	Permit Authority
R.D. N° 072-2019-SENACE-PE/DEAR	First Supporting Technical Report of the Toquepala Mining Unit	April 26, 2019	National Environmental Certification Service for Sustainable Investments (Senace)
R.D. N° 103-2019-SENACE-PE/DEAR		July 3, 2019	
Water			
Resolution Nº 534-72-AG	Authorization in the process of adapting a water license for the use of up to 150 L/s	June 15, 1972	Ministerio de Agricultura/Dirección General de Aguas y Suelos
Resolution Nº 00405-77-AG/DGA	Authorization in the process of adapting a water license for the use of up to 60 L/s of the waters of the Cinto-Quebrada Honda river	April 12, 1977	Ministerio de Agricultura/Dirección General de Aguas y Suelos
R.D. N° 053-88- DGAS-UA-SUTD	Modification of resolution R.S. N° 535-72-AG from 2,000 L/s to 300 L/s	April 20, 1988	Ministerio de Agricultura/Dirección General de Aguas y Suelos
R.D. Nº 271-2010-ANA/AAA I C-O	Regularization of the License for the use of surface water, reallocating volumes of the R.M. N ° 405-77-AG/DGA	December 31, 2010	National Water Authority
R.D. Nº 0062-83-AG-DGASI	License to use an annual mass of up to 13,268,966 m^3 of groundwater extracted through four tube wells from the "Huaitire" basin	June 15, 1983	Ministry of Agriculture
R.A. Nº 002-94-DISRAG/ATDR/S	License for the use of an annual mass of 5'991,840 m^3 of groundwater captured from tubular wells TP-11 and TP-12 drilled in the "Huaitire-Gentilar" hydrographic basin	1994	Ministry of Agriculture
R.A. Nº 169-95-DISRAGT/ATDRL/S	License to use groundwater in the Vizcachas basin of up to 360 L/s	July 12, 1995	Ministry of Agriculture
R.A. Nº 020-2003-ATDR.M/DRA.M	Adequacy of the water use license granted to in the R.M. N ° 00899-79-AA/DGAS and R.A. N ° 002-94-DISRAG/ATDRL-S up to 9'744,624 m^3	April 1, 2003	Ministry of Agriculture

Permit Number	Permit	Date Issued	Permit Authority
R.A. N° 0034-2005-DRA.T/GR.TAC/ATDRL/S	Groundwater use license with a flow of 162.2 L/s, equivalent to an annual mass of 5'115,139 m^3 captured by two tubular wells TP-14 and TP-15 located in the Huaitire-Gentilar basin.	January 28, 2005	Ministry of Agriculture
Discharges			
R.D. N° 190-2018-ANA-DCERH	Extend the authorization for the discharge of treated industrial wastewater from the Quebrada Honda reservoir	November 26, 2018	National Water Authority
Construction and Operation			
R.D. N° 178-94-EM/DGM	• Approve the disposal and storage of tailings from the Toquepala and Cuajone concentrators of the "Quebrada Honda" • Approve the construction license of a dam and tailings field	May 27, 1994	Ministry of Energy and Mines
R.D. N° 166-96-EM/DGM	Approve the Benefit Concession for the "SX/EW Toquepala Leaching Plant" with an area of 60 ha	May 17, 1996	Ministry of Energy and Mines
Report N° 493-98-EM-DGM/DPDM	Authorization for the operation of the "Quebrada Honda" tailings deposit	August 24, 1998	Ministry of Energy and Mines
Report N° 291-2003-EM-DGM/DPDM	Authorization to expand the installed capacity of the Processing Plant "SX/EW Toquepala Leaching Plant"	May 19, 2003	Ministry of Energy and Mines
Resolution N° 378-2011-MEM-DGM/V	Modification of the Benefit Concession called "Toquepala Concentrator" for the expansion of the additional facilities area without modifying the installed capacity of the plant.	October 24, 2011	Ministry of Energy and Mines
Resolution N° 144-2015-MEM-DGM/V	Modification of the "Concentradora Toquepala" Benefit Concession for the expansion of installed capacity from 60,000 Mt/d to 120,000 Mt/d	April 14, 2015	Ministry of Energy and Mines

Permit Number	Permit	Date Issued	Permit Authority
R.D. N° 0015-2017-MEM/DGM	• Expansion of the "Concentradora Toquepala" benefit concession to 300.32 ha. • Operation authorization of primary crusher No. 2, transportation system, intermediate pile and auxiliary facilities of the technological improvement project of the Toquepala beneficiation plant	January 11, 2017	Ministry of Energy and Mines
Resolution N° 0058-2019-MEM-DGM/V	Modification of the "Concentradora Toquepala" benefit concession, for the re-growth of the tailings dam "Embalse de Quebrada Honda" from elevation 1,190 masl. at 1,240 masl with expansion of the area	February 12, 2019	Ministry of Energy and Mines
Resolution N° 0273-2019-MEM-DGM/V	Approval of the operation of the Phase I copper plant equipment at a new capacity of 120,000 t/d	June 03, 2019	Ministry of Energy and Mines

Note: R.D. = Directorial Resolution; R.A. = Administrative Resolution

Table 17-2: Key Permits, Ilo Smelter/Refinery

Permit Number	Permit	Date Issued	Permit Authority
R.D. N° 078-69-EM/DGM	Definitive operating authorization for the Ilo smelter, with a production of 400 st/d of blister copper	August 21, 1969	Ministry of Energy and Mines
Report N° 204-2000-EM-DGM-DPDM	Operation authorization of the "La Fundición" beneficiation concession with a capacity of 3,100 t/d of copper concentrate	June 20, 2000	Ministry of Energy and Mines
Resource N° 1961695	Operation authorization to capacity of 3,770 t/d	February 4, 2010	Ministry of Energy and Mines
Report N° 056-94-EM-DGM/DRDM	Operation authorization of the Ilo copper refinery with a capacity of 533 t/d for the treatment of blister copper	May 27, 1994	Ministry of Energy and Mines
Report N° 506-97-EM-DGM/DPDM	Authorization of the Ilo smelter, with an expanded capacity of 658 t/d	September 2, 1998	Ministry of Energy and Mines
Report N° 080-2002-EM-DGM/DPDM	Authorization for the operation of the Ilo smelter, with a capacity of 800 t/d	March 14, 2002	Ministry of Energy and Mines
Resolution N° 520-2010-MEM-DGM/V	Modification of the Ilo copper refinery beneficiation concession without modification of installed capacity	December 30, 2010	Ministry of Energy and Mines

Note: R.D. = Directorial Resolution

The operations maintain a permit register, which includes a record of the legal permits obtained, the approval authority, permit validity period and expiration dates, permit status (current, canceled or replaced) and whether or not the permit requires renewal. The operations also have a control and monitoring system to ensure that the requirements of each permit are monitored to comply with the relevant regulatory conditions imposed.

17.4.2 Additional Permitting Requirements

Portions of the proposed WRSFs that support the mine plan are outside the area that Southern Copper currently holds under surface rights, and additional surface rights will need to be secured. It is expected that waste will need to be disposed in these areas starting in 2025, 2035 and 2042.

Additional tailings storage capacity is required to accommodate tailings once the existing Quebrada Honda TSF reaches the ultimate storage capacity in approximately the end of 2036. Wood assumed that the Toquepala mine will dispose of filtered tailings in a standalone dry stack facility that would be located near the Quebrada Honda TSF area, as limited space is available at the Toquepala site.

Southern Copper is of the opinion that the company will have sufficient time to acquire the necessary surface rights, as well as the respective permits and/or assignment of the mining concessions to support the planned WRSFs expansion and new TSF.

17.5 Social Considerations, Plans, Negotiations and Agreements

The EIA completed in 2014 found no populations or cultivated areas that could be directly influenced by the Toquepala Operations. The area of indirect influence was identified as including the districts of Locumba and Ilabaya, in the province of Jorge Basadre in Tacna, and the district of Moquegua, in the province of Mariscal Nieto in Moquegua.

An updated 2021 social baseline found that in the area of indirect influence, the Locumba and Ilabaya districts had populations <10,000 people. Moquegua has a population of about 68,000. The key activities within Locumba are agriculture, livestock, forestry, and fishing. In Ilabaya, the main activity is construction, whereas in Moquegua, the major activities are commerce, repair of automatic vehicles and motorcycles.

Southern Copper has community programs as part of its Social Management Plan that focus on a number of key goals, including:

- Co-existence with local communities on a good neighbors basis
- Promotion of local economic development
- Promotion of individual community member capabilities.

The programs under the Social Management Plan include:

- Communication and Consultation Program
- Participatory Environmental Monitoring and Surveillance Program
- Local Employment Program
- Local Capacity Building Program
- Institutional Strengthening Program
- Water Infrastructure Improvement Program
- Conflict Prevention Program
- Social Closure Program.

Reasonable mechanisms are being implemented to maintain relationships with surrounding communities, to mitigate any perceived social conflicts that could be associated with the Project.

Southern Copper has communication channels and tools in place, based on the company's community development model, which allow the company to recognize potential conflicts early, to work with the community to find appropriate solutions to address their concerns, and generate positive social license conditions for the continued operation of Southern Copper's mining projects.

17.6 Qualified Person's Opinion on Adequacy of Current Plans to Address Issues

After reviewing the information provided, Wood's QP is of the opinion that Southern Copper has appropriately implemented a system to identify and mitigate social issues that arise during operations. Wood considers that social risks to the Project are well understood by Southern Copper and are reasonably manageable for the Toquepala Operations. Wood's QP considers Southern Copper's current plans are adequate to address any issues related to environmental compliance, permitting, and local individuals or groups.

18.0 CAPITAL AND OPERATING COSTS

18.1 Introduction

Capital and operating cost estimates are at a minimum at a pre-feasibility level of confidence, with an accuracy range of ±25%, and an overall contingency of no more than 15%.

18.2 Capital Cost Estimates

18.2.1 Basis of Estimate

In general, the Toquepala Operations have the necessary facilities to carry out its current operations. Sustaining capital costs were estimated by area and allocated over time to support the proposed mine production schedule at current production throughputs, and include the following:

- Mine equipment fleet increase and replacement, and maintenance
- Truckshop expansion to serve increased mining equipment fleet
- Waste dumps development
- Existing tailings storage facility (Quebrada Honda) raise
- Filtered tailings plant and land acquisition for tailings management
- Leach primary crusher relocation
- Process facilities sustaining and maintenance
- Other general sustaining and maintenance.

All capital costs were expressed in Q3 2022 US dollars unless otherwise stated. Where costs used in the estimate were provided in currencies other than US dollars, the following exchange rate as provided by Southern Copper, was used:

- 2022: 1.00 US$ = 3.81 PENS/

No allowances were made for fluctuations in exchange rates.

Mine equipment requirements were estimated by operating area (drilling, loading, hauling, support, etc.) based on the proposed LOM plan and equipment replacement ratios provided by Southern Copper. Capital costs for the major mine mobile equipment were based on recent pricing provided by Southern Copper and support mine mobile equipment were based on purchases made by Southern Copper in recent years. Support mine mobile equipment costs account for approximately 10% of the total mine mobile equipment cost. No contingency was applied to mining equipment costs. Mine equipment maintenance costs were accounted for based on unit costs derived from the 2023–2027 sustaining and maintenance cost schedule developed by Southern Copper and a percentage of major equipment costs to account for spare parts based on benchmark, resulting in an overall unit cost of US$0.19/t mined.

A truckshop expansion is required in about 2024, to accommodate maintenance of a larger mining fleet. Eight additional bays will be added to the existing Toquepala truckshop. Costs were used from an internal study on another Southern Copper project and adjusted to account for difference in size and escalation to Q3-2022 using a combination of normalization factors and current rates to develop the capital cost estimate at a conceptual level. Indirect costs were applied based on benchmark factors. A contingency of 20% of the direct and indirect cost was included.

Additional land is required for the development of WRSFs to support the LOM mine production schedule. Land acquisition costs were provided by Southern Copper based on ongoing negotiations with landowners and market surveys.

The costs associated with the raise of the existing Quebrada Honda TSF accounts for the works to expand the TSF to its maximum design storage capacity until approximately the end of 2036, which include:

- Main and lateral dykes drainage systems
- Relocation of the catchment pond of the lateral dyke
- Relocation of cyclone station 2101
- Relocation of offices, workshops, control room and tanks
- Supporting equipment, barges and lime plant sustaining costs.

These costs were estimated by Southern Copper in 2021 based on a combination of overall costs incurred in similar previous works executed, quantities derived from conceptual designs and unit costs from similar previous works executed, and costs allowances, and were escalated to Q3 2022 using a combination of normalization factors and current rates. Costs are inclusive of direct and indirect costs and a contingency of 20% of the direct and indirect costs. These costs were distributed between the Cuajone and Toquepala Operations proportionally to nominal mill feed throughputs of each.

Additional tailings storage capacity is required to accommodate tailings from processing of the remaining LOM ore once the existing Quebrada Honda TSF reaches the ultimate storage capacity at approximately the end of 2036. Wood assumed dry stack tailings as the preferred alternative to process and store the remaining tailings (starting from 2037).

It is assumed that the Toquepala Operations will dispose the filtered tailings in a standalone dry stack facility to be located near the Quebrada Honda TSF area, as limited space is available on the Toquepala site. The capital cost estimates include:

- Costs for the procurement and development of required facilities for the thickening/drying/filtering process infrastructure for the tailings materials and subsequent disposal in the dry stack facility. Costs from a 2020 internal study of another Southern Copper project that considered disposing tailings by comingling waste rock and filtered tailings materials were used and adjusted to account for difference in throughput and escalation to Q3 2022 using a combination of normalization factors and current rates to develop the capital cost estimate at a conceptual level, complemented with engineering judgement and costs derived from projects of similar applications. Indirect costs were applied based on benchmark factors. A contingency of 20% of the direct and indirect cost was included.
- Costs for the procurement and development of the pumping system to pump the recovered water at the tailings filtering plant to the Toquepala Operation were estimated by Southern Copper at a conceptual level, based on the costs incurred in a previous similar project that was executed by Southern Copper, and were escalated to Q3 2022. A contingency of 15% of the direct and indirect cost was included.
- US$20.1 million were included for the power supply with the cost provided by Southern Copper and escalated to Q3 2022.
- Land acquisition costs as provision for tailings management space were also included in the estimate. Land acquisition costs were provided by Southern Copper and were based on market surveys.

Sustaining costs of US$0.8 million each year and US$16.5 million every three years were included for relocating conveyors for continued operation, equipment replacement associated with the conveyor systems, and additional cost related to changing/updating filtering equipment.

A filtered tailings pilot plant with a production capacity between 8 and 10 kt/d is currently under construction near the Quebrada Honda TSF area. US$23.2 million were included as the remaining cost estimated by Southern Copper to complete the construction of this facility, and were distributed between the Cuajone and Toquepala Operations proportionally to nominal mill feed throughputs of each. Southern Copper expects to have this new system operational at the beginning of 2023.

To allow the pit development, it is estimated that the low-grade sulfide primary crusher will need to be relocated. For operational purposes, Southern Copper expects to undertake this work in about 2023–2024. The associated cost was estimated by Southern Copper in 2021 based on quantities derived from a conceptual design and cost allowances, and was escalated to Q3 2022 using a combination of normalization factors and current rates. Indirect costs were applied based on benchmark factors. A contingency of 20% of the direct cost was included.

Process facilities sustaining and maintenance, and other general sustaining and maintenance costs were accounted for based on the following unit costs derived from the 2023–2027 sustaining and maintenance cost schedule developed by Southern Copper. No contingency was applied to these estimates.

- Processing facilities sustaining and maintenance:
  - Concentrators = US$0.33/t processed for sustaining and US$0.38/t processed for maintenance
  - LESDE area = US$603.25/t of cathode produced
  - Ilo smelter and refinery = US$24.92/t of concentrate treated
- Other sustaining and maintenance = US$0.16/t processed (concentration and leaching).

18.2.2 Capital Cost Estimate Summary

The LOM sustaining capital cost estimate totals US$8,739.0 million (Table 18-1).

Capital costs were applied in the financial model excluding value-added tax.

Table 18-1: Sustaining Capital Cost Estimate

Area	Sustaining Capital Cost (US$M)
Mining equipment	4,499.7
Truckshop expansion	32.1
Waste dumps development	30.3
Existing tailings storage facility (Quebrada Honda) raise	137.7
Filtered tailings plant, including land acquisition and pilot plant	996.1
Primary crusher relocation	66.9
Process facilities sustaining and maintenance	2,518.2
Other general sustaining and maintenance	457.8
Total	**8,739.0**

Note: Numbers have been rounded. Totals may not sum due to rounding.

18.3 Operating Cost Estimates

18.3.1 Basis of Estimate

Operating costs were based on actual costs and data from Southern Copper's operating mines in Peru, Wood's experience and the proposed mine and process plans.

18.3.2 Mining Costs

Operating costs incorporated operational life, average availabilities, and efficiencies for the major mine equipment fleet. The equipment operating time inputs were adjusted by Southern Copper to reflect operating considerations.

Inputs for drill productivity and blasting accessory costs were provided by Southern Copper. Explosives costs were estimated by consumption ratios provided by Southern Copper, based on operational data.

The inputs and main consumable costs were provided by Southern Copper. Additional load-and-haul design criteria were based on operational parameters from the Cuajone Operations.

Vehicle speeds and diesel consumption were based on grouping roads with similar inclinations into segments.

The mine equipment power consumption rate was provided by Southern Copper. The estimated fuel price for the LOM was US$3.34/gal and the energy price was US$0.073/kWh.

The maintenance and repair cost includes the costs to repair and replace parts including rebuild labor. The replacement cost for truck tires was estimated at US$49,392/tire with a life of 5,529 hours.

The technical manpower required was estimated based on the actual organizational structure.

Salaries were provided by Southern Copper.

The total material mined is estimated at 9,303 Mt. Mine operating costs are forecast to average US$2.12/t mined over the LOM. The mine cost increases gradually starting at US$1.94/t mined in Year 1 (2023) to a cost of US$2.51/t mined in year 50 (2072), due to the increase in ex-pit hauling distance (WRSFs) and the deepening of the pit.

In addition to mining costs, costs associated with the material preparation for leaching at the crushed ore leach dump (referred to as the Quebalix facility) are also accounted for in this area.

18.3.3 Process Costs

Process operating costs were based on a combination of actual costs averages over the period 2018–2022, adjusted to account for the LOM based on expected variations of key commodities costs such as energy, consumables, and services; and a projection of the leaching and SX/EW costs provided by Southern Copper based on the leach and cathodes production schedule and operational parameters and main consumable costs based on data from their operations. Processing costs include concentration costs, leaching and SX/EW cathode recovery, and smelting and refining at Ilo, which are inclusive of:

- Labor costs
- Power and fuel costs for usage by equipment, vehicles and infrastructure
- Materials costs for the concentrators included consumables such as grinding media, crushing and grinding liners, and reagents. For the leach/SX/EW plant included costs of piping supplies and reagents such as sulfuric acid, cobalt sulfate, and extractants. For the smelter this cost element included the cost of silica, refractory and steel consumables, piping and electrical supplies, and liquified petroleum gas. For the refinery, this cost element included electrical supplies, reagents, piping and valves, and laboratory supplies
- The “services and other” cost element includes the cost of water, contractor work costs (operation and maintenance), laboratory services, and other indirect costs.

Operating costs associated with tailings disposal at the existing Quebrada Honda TSF are included as part of concentrator costs.

Silver shots and gold-bearing doré bars are normally produced in the Ilo refinery; however, as neither revenue from the silver shots and gold-bearing doré bars nor the production costs for the silver shots and gold-bearing doré bar, were considered in the economic analysis, the cost estimate reported for the Ilo refinery excludes the precious metals plant operating cost.

Operating costs estimates for the concentrators are presented in Table 18-2, for the LESDE facility in Table 18-3, for the Ilo smelter in Table 18-4, and for the Ilo refinery in Table 18-5.

Table 18-2: Toquepala Concentrator Operating Costs

Adjusted Average 2020–2022 (US$/t milled)	Concentrator 1	Concentrator 2
Labor	1.08	0.66
Fuels	0.05	0.02
Power	1.45	1.69
Materials	3.39	3.56
Services and others	0.89	0.82
Total Cost	**6.85**	**6.74**

Note: Numbers have been rounded. Totals may not sum due to rounding.

Table 18-3: Toquepala Leaching and SX/EW Operating Costs

Area	LOM Costs Range ($/lb Cu recovered)
Labor	0.14 – 1.30
Fuels	0.05 – 0.35
Power	0.34 – 1.42
Materials	0.43 – 3.11
Services and Others	0.14 – 1.20
Total Cost	**1.13 – 7.39**

Note: Numbers have been rounded. Totals may not sum due to rounding.

Table 18-4: Ilo Smelter Operating Costs

Area	Adjusted Average 2018–2022 (US$/t of concentrate processed)
Labor	36.52
Fuels	12.29
Power	21.21
Materials	39.47
Services and Others	26.72
Total Cost	**136.22**

Note: Numbers have been rounded. Totals may not sum due to rounding.

Table 18-5: Ilo Refinery Operating Costs

Area	Adjusted Average 2018–2022 (US$/lb Cu recovered)
Labor	0.0280
Fuels	0.0005
Power	0.0097
Materials	0.0103
Services and Others	0.0225
Total Cost	**0.0709**

Note: Numbers have been rounded. Totals may not sum due to rounding.

In addition to the estimates described above, an alternate tailings processing and storage option is required to process the remaining life-of-mine (LOM) ore once the existing Quebrada Honda TSF reaches the ultimate storage capacity at approximately the end of 2036. Wood assumed dry stack tailings as the preferred alternative to process and store the remaining tailings (starting from 2037) in a standalone dry-stack facility to be located near the Quebrada Honda TSF area, as limited space is available on the Toquepala site. A cost of US$1.99/t was estimated at conceptual level from a 2020 internal study of another Southern Copper project that considered disposing tailings by comingling waste rock and filtered tailings materials, complemented with a conceptual estimate developed by Southern Copper, engineering judgement on costs derived from projects of similar applications, and escalation to Q3 2022 using normalization factors.

US$5.8 million per year were included for the operation of the filtered tailings pilot plant with the cost provided by Southern Copper. This cost was applied from 2023 to 2036 (the year before the main thickening/drying/filtering process infrastructure is assumed to start operations) distributed between the Cuajone and Toquepala Operations proportionally to nominal mill feed throughputs of each.

18.3.4 General and Administrative Costs

General and administrative costs are included in the corresponding mining and processing costs.

18.3.5 Operating Cost Estimate Summary

Table 18-6 is a summary of the operating cost estimates, exclusive of value-added taxes.

Southern Copper assumes in its cashflow planning that the Tia Maria Project will source its required sulfuric acid for that operation from the Ilo smelter and refinery at the cost of production. This represents approximately 720,000 t/a, or about 60% of the total acid production from the Ilo smelter, over approximately 20 years. This cost of producing sulfuric acid was removed from the Ilo smelter operating costs.

Table 18-6: Toquepala LOM Operating Cost Estimate

Description	Total (US$M)	Unit Cost	
Mining	19,901.8	US$/t mined *	2.14
Process	25,069.7	US$/t processed **	8.79
Total	**44,971.5**		

Note: Numbers have been rounded. Totals may not sum due to rounding.
* Including preparation costs at the crushed ore leach dump (Quebalix facility)
** Including ore for concentration and leaching, excluding existing material in leach dumps

19.0 ECONOMIC ANALYSIS

19.1 Forward-looking Information Caution

Certain information and statements contained in this section are forward-looking in nature and are subject to known and unknown risks, uncertainties, and other factors, many of which cannot be controlled or predicted and may cause actual results to differ materially from those presented here. Forward-looking statements include, but are not limited to, statements with respect to the economic and study parameters of the Toquepala Operations; mineral reserves; the proposed mine plan and mining strategy; ability of mine designs to withstand seismic events; dilution and extraction recoveries; processing method and rates and production rates; projected metallurgical recovery rates; infrastructure requirements; capital, operating and sustaining cost estimates; concentrates and cathodes marketability and commercial terms; the projected LOM and other expected attributes of the Project; the net present value (NPV); future metal prices and currency exchange rates; government regulations and permitting timelines; estimates of reclamation obligations; requirements for additional capital; environmental and social risks; and general business and economic conditions.

19.2 Methodology

The financial analysis was performed using a discounted cash flow (DCF) method. Net annual cash flows were estimated projecting yearly cash inflows (or revenues) and subtracting projected yearly cash outflows (such as capital and operating costs, royalties, and taxes).

The financial model that supports the mineral reserve declaration was a standalone model that calculated annual cash flows based on: scheduled ore production; assumed processing recoveries; metal sale prices; projected operating and capital costs; and estimated taxes.

The financial analysis was based on an after-tax discount rate of 10%. Cash flows were assumed to occur at the end of each year and were discounted to the beginning of 2023 (Year 1 of the economic analysis).

Costs projected within the cash flows are based on constant Q3 2022 US dollars.

Revenue was calculated from the recoverable metal and the long-term forecasts of metal prices and exchange rates. Recoverable metal and products include those recovered at the Ilo smelter and refinery from the copper concentrate feed from the mine operation.

19.3 Input Parameters

19.3.1 Mineral Reserves and Mine Life

The mineral reserves estimate was summarized in Chapter 12.3. The projected mine life was provided in Chapter 13.4.

19.3.2 Metallurgical Recoveries

The metallurgical recovery forecast was provided in Chapter 10.4.

19.3.3 Smelting and Refining Terms

The following long-term commercial terms and charges were used in the cashflow model. These were based on current contract terms. Transport costs were based on average costs incurred from 2020 to August 2022 using normalized values to Q3 2022.

19.3.3.1 Copper Concentrate

The cashflow assumes, based on Southern Copper's forecast, that on average, in those years when the total annual copper concentrate production from Cuajone and Toquepala Operations is equal or less than the Ilo Smelter nominal capacity (1.2 Mt/a of Cu concentrate), all the copper concentrate from the Cuajone and Toquepala Operations will be treated at the Ilo smelter; in those years when the total annual copper concentrate production from Cuajone and Toquepala Operations exceeds the Ilo smelter nominal capacity up to 10%, 90% of the copper concentrate from the Cuajone and Toquepala Operations will be treated at the Ilo smelter, with the remaining 10% sent to third parties; and in those years when the total annual copper concentrate production from Cuajone and Toquepala Operations exceeds the Ilo smelter nominal capacity in more than 10%, the copper concentrate from the Cuajone and Toquepala Operations will be treated at the Ilo smelter at nominal capacity, with surplus concentrate production sent to third parties.

A concentrate transport loss of 0.2% was included, based on benchmarks. A concentrate moisture of 8.25%, which was the average value from 2021 to August 2022, was considered for the copper concentrate.

The following commercial terms were applied to the portion of the copper concentrate that is assumed to be sold to third parties:

- Pay factors:
  - Pay for 96.5% of Cu content, subject to a minimum deduction of 1.0 unit
- Treatment and refining charges (TC/RCs):
  - TC = US$65.00/dmt
  - Cu RC = US$0.065/lb Cu payable.

Ocean freight costs were estimated at US$44.60/t from the port of Ilo. These costs were based on average costs from 2021 to August 2022 using normalized values to Q3 2022. Land transport (by rail) and port costs were included in the operating costs.

19.3.3.2 Molybdenum Concentrate

Normally over 60% of the molybdenum concentrate is sold to Chile, with the remainder sold into the Northern Europe, Asia, and the US markets. The following commercial terms were assumed:

- Pay factors:
  - Pay 100% for Mo content
- Treatment and refining charges:
  - Roasting charge of US$1.59/lb payable Mo. This cost was based on the average cost from 2020 to August 2022 using normalized values to Q3 2022
- No price participation or penalties were applicable
- No transport losses were considered.

A concentrate moisture of 10.66% was used for the molybdenum concentrate, which was the average value from 2021 to August 2022.

Ocean freight costs were estimated at US$199.60/t of Mo contained in concentrate from the port of Ilo. This cost was based on the average from 2020 to August 2022 using normalized values to Q3 2022. Land transport (by rail) and port costs were included in the operating costs.

19.3.3.3 Copper Cathodes

The copper cathodes produced are typically sold to different markets located in the Americas, Europe, and Asia. The following commercial terms were assumed:

- Pay for 100% of the copper content subject to a premium of US$90.41/t. This cost was based on the average premium from 2020 to August 2022 using normalized values to Q3 2022.

- No price participation was applicable.

Ocean freight costs were estimated at US$71.15/t from the port of Ilo. This cost was based on the average cost from 2020 to August 2022 using normalized values to Q3 2022. Land transport (by rail) and port costs were included in the operating costs.

19.3.3.4 Ilo Smelter and Refinery

Copper Blister/Anodes

Typically, about only about 4.50% of the copper anodes produced are sold to third parties, which are primarily located in Asia. Most of the anodes, 95.50%, are sent to the Ilo refinery for cathode production. The anode copper content is assumed at 99.775%. The remaining 0.225% of the anode content includes silver, gold, sulfur, oxygen and other elements, none of which are assumed payable. The following commercial terms were assumed:

- Pay factors:
  - Pay for 100% of the copper content subject to a deduction of 0.3%
- No price participation was applicable
- TC/RCs:
  - TC: zero
  - RC: US$178.67/t of anode. This cost was based on the average cost from 2020 to August 2022 using normalized values to Q3-2022.

Ocean freight costs were estimated at US$89.38/t from the port of Ilo. This cost was based on the average cost from 2020 to August 2022 using normalized values to Q3 2022. Land transport (by rail) and port costs were included in the operating costs.

Copper Cathodes

Cathode assumptions are the same as those detailed under Chapter 19.3.3.3.

Silver Shots

Silver shots have been produced and are typically sold to the US, Brazil, Peru, Chile, Argentina, and Colombia. Because silver was not estimated in the mineral resources or mineral reserves, silver shot revenue is not included in the production schedule or economic analysis, nor were silver shot production costs considered.

Gold Doré Bars

Gold-bearing doré bars have been produced in the past are sold locally in Perú. Because gold was not estimated in the mineral resources or mineral reserves, gold-bearing doré bar's revenue is not included in the production schedule or economic analysis, nor were the gold-bearing doré bar's production costs considered.

Sulfuric Acid

Approximately 88% of the sulfuric acid produced is sold within South America, with 60% of that acid production figure going to Chile, and 40% to Peru. The remaining 12% is used in the Cuajone and Toquepala Operations.

Southern Copper assumes, in its cashflow planning, that the Tia Maria Project will source the required sulfuric acid for that operation from the Ilo smelter and refinery at the cost of production, which represents approximately 720,000 t/a, or about 60% of the total acid production from the Ilo smelter.

All other revenue from acid sales apart from that from the Tia Maria project have been excluded from the financial model.

19.3.4 Commodity Price and Exchange Rate Assumptions

Revenue was calculated from the recoverable metal and the long term forecast of metal prices and exchange rates. Revenue from the sale of a copper concentrate is included, based on the contained metal, accountability factors and the long term forecast for metals prices and exchange rates. Recoverable metal and products include those recovered at the Ilo smelter and refinery from the Cu concentrate feed from the mine operation.

Commodity price and exchange rate forecasts were provided in Chapter 16.5.

19.3.5 Capital Costs

The capital cost estimate was summarized in Chapter 18.2.2.

19.3.6 Operating Costs

The operating cost estimate was summarized in Chapter 18.3.5.

19.3.7 Royalties

Special mining taxes and the modified mining royalty are discussed in Chapter 3.2.3. There are no other royalties payable on the Toquepala Operations.

19.3.8 Working Capital

Working capital provisions in the cashflow analysis included:

- 60 days in accounts receivable, including revenue
- 30 days in accounts payable, including concentrates, anodes and cathodes selling costs, operating costs, special mining tax and modified mining royalty.

19.3.9 Closure and Reclamation Costs

Closure costs were provided in Chapter 17.3. Closure costs were allocated in the relevant cashflow years based on the progressive, final and post closure schedule. It was assumed that closure cost accruals are not required, and closure obligations will be satisfied by either escrow with other Southern Copper assets as collateral, a bond, or a bank letter of credit.

The salvage value was assumed to be zero.

19.3.10 Financing

All expenditures were assumed to be financed with 100% equity; i.e., no debt was considered.

19.3.11 Inflation

No escalation or inflation was applied. All amounts were constant (real) Q3 2022 terms.

19.3.12 Taxation Considerations

The taxation modeled within the financial analysis is based on the taxation scheme that was provided and validated by Southern Copper.

The assumptions include:

- All expenses excluded the value-added tax (Impuesto General a las Ventas (IGV), except for closure costs which do include IGV

- Modified mining royalty (Law N° 29788)
- Special mining tax (Law N° 29789)
- Employee profit sharing of 8% of taxable income
- Corporate income tax rate of 29.5%
- Complementary mining pension fund applied at 0.5% of taxable income after employee profit sharing
- Tax loss carried forward not applicable.

Tax depreciation is straight line and is divided into the following categories:

- Non-depreciable: land acquisition
- 10 years (10% annual): mining and process equipment (including sustaining and maintenance items)
- 20 years (5% annual): filtering tailings plant and supporting infrastructure (including pilot plant), primary crusher relocation, and Ilo smelter and refinery ongoing sustaining and maintenance items
- 30 years (3.3% annual): mining supporting facilities (truckshop), expansion of existing TSF, and other ongoing sustaining and maintenance items (not included in schedules above).

The same rates are used for financial depreciation.

Depreciation from previous expenditures and existing assets, including those from the Ilo smelter and refinery, in the amount of $1,536.5 million, as provided by SCC, was accounted for in the financial model for both tax and financial depreciation.

19.4 Results of Economic Analysis

The Toquepala Operations are anticipated to generate a pre-tax NPV of US$3,018.5 million at a 10.0% discount rate and an after-tax NPV of US$1,818.1 million at a 10.0% discount rate.

As the mine is operating, and the initial capital is sunk, considerations of IRR and payback are not relevant.

A cashflow summary is provided in Table 19-1, and the LOM cashflow forecast on an annualized basis in Table 19-2 to Table 19-7.

Table 19-1: Summary of Economic Results

Description	Unit	Value
Remaining mine life	years	50
Copper payable	Mlb	19,641.9
Molybdenum payable	Mlb	691.1
After-Tax Valuation Indicators		
Undiscounted cash flow	US$M	9,461.6
NPV @ 10.0%	US$M	1,818.1
Sustaining capital	US$M	8,739.0
Closure cost (inc. IGV)	US$M	355.7
Mining operating cost	US$M	19,901.8
Process operating cost	US$M	25,069.7

Note: Numbers have been rounded. IGV = value-added tax (Impuesto General a las Ventas

Table 19-2: Cash Flow Forecast on an Annual Basis (2023–2031)

Area	Unit	Total	2023	2024	2025	2026	2027	2028	2029	2030	2031
MINE PRODUCTION											
Waste mined	Mt	**6,450.1**	178.6	199.9	177.2	193.6	163.1	140.1	118.0	179.6	204.1
Total ore mined	Mt	**2,853.2**	56.4	60.1	82.8	66.4	66.9	89.9	112.0	67.9	51.1
Sulfide Ore Mined (concentration)											
Sulfides ore mined	Mt	**2,144.6**	41.3	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9
Cu head grade	%	**0.47**	0.54	0.58	0.58	0.51	0.53	0.57	0.57	0.50	0.45
Mo head grade	%	**0.021**	0.021	0.023	0.023	0.020	0.018	0.017	0.025	0.020	0.023
Oxide/Sulfide Ore Mined (leaching)											
Oxide ore mined	Mt	**708.6**	15.1	17.2	39.9	23.5	24.0	47.0	69.1	25.0	8.2
Cu head grade	%	**0.16**	0.16	0.16	0.18	0.18	0.17	0.14	0.16	0.18	0.18
PROCESS PRODUCTION											
Feed to Mill (sulfides)											
Sulfide ore feed	Mt	**2,144.6**	41.3	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9
Cu feed grade	%	**0.47**	0.54	0.58	0.58	0.51	0.53	0.57	0.57	0.50	0.45
Mo feed grade	%	**0.021**	0.021	0.023	0.023	0.020	0.018	0.017	0.025	0.020	0.023
Feed to Leach (sulfide/oxide)											
Sulfide/oxide ore feed	Mt	**708.6**	15.1	17.2	39.9	23.5	24.0	47.0	69.1	25.0	8.2
Cu feed grade	%	**0.16**	0.16	0.16	0.18	0.18	0.17	0.14	0.16	0.18	0.18
METAL RECOVERY											
Concentration											
Cu recovered	Mlb	**19,534.2**	433.1	485.0	485.0	429.7	445.3	485.0	485.0	423.9	379.2
Mo recovered	Mlb	**691.1**	12.5	14.2	14.5	12.3	10.9	10.4	15.9	12.5	14.9
Leaching											
Cu recovered	Mlb	**696.3**	41.5	36.8	36.1	34.8	32.0	31.4	32.3	30.5	25.3

Area	Unit	Total	2023	2024	2025	2026	2027	2028	2029	2030	2031
PAYABLE METALS											
Cu payable	Mlb	**19,641.9**	461.4	506.4	505.7	451.2	463.7	501.5	502.4	441.9	393.3
Mo payable	Mlb	**691.1**	12.5	14.2	14.5	12.3	10.9	10.4	15.9	12.5	14.9
METAL VALUE											
Cu payable value	US$M	**65,545.3**	1,539.1	1,687.6	1,685.3	1,504.7	1,546.7	1,673.0	1,676.0	1,475.7	1,313.3
Mo payable value	US$M	**6,910.7**	124.7	141.7	144.7	123.5	108.8	104.1	158.8	125.2	149.4
Total Metal Value	**US$M**	**72,456.0**	**1,663.8**	**1,829.2**	**1,830.0**	**1,628.2**	**1,655.6**	**1,777.1**	**1,834.8**	**1,600.9**	**1,462.7**
TREATMENT AND REFINING CHARGES (TC&RCS)											
Cu concentrate TC&RCs	US$M	**(206.4)**	(7.7)	(16.5)	(16.6)	(9.9)	(7.9)	(8.6)	(8.6)	-	-
Cu (Ilo) anodes TC&RCs	US$M	**(65.2)**	(1.4)	(1.4)	(1.4)	(1.3)	(1.4)	(1.6)	(1.6)	(1.5)	(1.3)
Mo concentrate TC&RCs	US$M	**(1,097.6)**	(19.8)	(22.5)	(23.0)	(19.6)	(17.3)	(16.5)	(25.2)	(19.9)	(23.7)
Total TC&RCs	**US$M**	**(1,369.2)**	**(28.9)**	**(40.4)**	**(41.0)**	**(30.9)**	**(26.6)**	**(26.7)**	**(35.4)**	**(21.4)**	**(25.1)**
TRANSPORT COSTS											
SX/EW cathodes transport	US$M	**(22.5)**	(1.3)	(1.2)	(1.2)	(1.1)	(1.0)	(1.0)	(1.0)	(1.0)	(0.8)
Cu concentrate transport	US$M	**(100.4)**	(3.7)	(8.0)	(8.1)	(4.8)	(3.8)	(4.2)	(4.2)	-	-
Ilo anodes transport	US$M	**(32.6)**	(0.7)	(0.7)	(0.7)	(0.7)	(0.7)	(0.8)	(0.8)	(0.8)	(0.7)
Ilo cathodes transport	US$M	**(549.7)**	(11.7)	(11.7)	(11.7)	(11.2)	(12.0)	(13.1)	(13.1)	(12.7)	(11.3)
Mo concentrate transport	US$M	**(62.6)**	(1.1)	(1.3)	(1.3)	(1.1)	(1.0)	(0.9)	(1.4)	(1.1)	(1.4)
Total Transport Costs	**US$M**	**(767.7)**	**(18.6)**	**(22.9)**	**(23.0)**	**(18.9)**	**(18.6)**	**(20.0)**	**(20.5)**	**(15.6)**	**(14.2)**
NET SMELTER RETURN	**US$M**	**70,319.1**	**1,616.3**	**1,765.9**	**1,766.0**	**1,578.4**	**1,610.4**	**1,730.4**	**1,778.9**	**1,563.9**	**1,423.4**
PRODUCTION COSTS											
Mining	US$M	**(19,901.8)**	(455.9)	(520.9)	(526.2)	(536.4)	(485.8)	(481.5)	(465.6)	(472.3)	(521.9)
Process	US$M	**(25,069.7)**	(451.1)	(459.5)	(459.5)	(453.5)	(461.8)	(472.9)	(472.9)	(468.8)	(454.8)
G&A	US$M	**-**	-	-	-	-	-	-	-	-	-
Total Production Costs	**US$M**	**(44,971.5)**	**(906.9)**	**(980.4)**	**(985.7)**	**(989.9)**	**(947.6)**	**(954.4)**	**(938.6)**	**(941.1)**	**(976.6)**

Area	Unit	Total	2023	2024	2025	2026	2027	2028	2029	2030	2031
MMR AND SMT											
Modified Mining Royalty	US$M	**(797.9)**	(16.3)	(17.9)	(17.9)	(16.0)	(16.3)	(17.5)	(18.0)	(15.8)	(14.4)
Special Mining Tax	US$M	**(477.4)**	(12.9)	(15.5)	(14.9)	(8.4)	(10.8)	(14.5)	(17.1)	(9.1)	(3.8)
MMR and SMT	**US$M**	**(1,275.3)**	**(29.3)**	**(33.4)**	**(32.8)**	**(24.4)**	**(27.1)**	**(32.0)**	**(35.1)**	**(24.9)**	**(18.2)**
NET OPERATING EARNINGS	**US$M**	**24,072.3**	**680.1**	**752.1**	**747.5**	**564.1**	**635.7**	**744.1**	**805.2**	**597.9**	**428.6**
TAXES											
Employee profit share	US$M	**(1,244.3)**	(36.5)	(42.7)	(41.6)	(26.3)	(32.1)	(40.4)	(45.9)	(27.9)	(13.2)
Complementary mining pension fund	US$M	**(71.5)**	(2.1)	(2.5)	(2.4)	(1.5)	(1.8)	(2.3)	(2.6)	(1.6)	(0.8)
Income tax	US$M	**(4,200.2)**	(123.3)	(144.2)	(140.3)	(88.7)	(108.2)	(136.2)	(154.8)	(94.3)	(44.7)
Total Taxes	**US$M**	**(5,516.0)**	**(161.9)**	**(189.3)**	**(184.2)**	**(116.5)**	**(142.1)**	**(178.9)**	**(203.3)**	**(123.8)**	**(58.7)**
CAPITAL COSTS											
Sustaining capital	US$M	**(8,739.0)**	(180.5)	(354.8)	(292.3)	(245.9)	(182.2)	(216.9)	(217.4)	(249.2)	(209.2)
Total Capital Costs	**US$M**	**(8,739.0)**	**(180.5)**	**(354.8)**	**(292.3)**	**(245.9)**	**(182.2)**	**(216.9)**	**(217.4)**	**(249.2)**	**(209.2)**
CLOSURE COST											
Closure cost	US$M	**(355.7)**	-	-	-	-	-	-	-	(1.8)	(1.8)
WORKING CAPITAL											
Change in Working Capital	US$M	**-**	(192.6)	(19.5)	0.3	31.7	(8.1)	(18.9)	(9.8)	36.3	25.3
NET CASH FLOW											
Before tax	US$M	**14,977.6**	307.0	377.9	455.6	349.9	445.3	508.3	578.1	383.1	242.8
After tax	US$M	**9,461.6**	145.1	188.5	271.4	233.4	303.2	329.4	374.7	259.3	184.1

Note: Numbers have been rounded. Totals may not sum due to rounding.

Table 19-3: Cash Flow Forecast on an Annual Basis (2032–2041)

Area	Unit	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
MINE PRODUCTION											
Waste mined	Mt	182.6	191.0	185.1	182.6	186.4	158.6	150.2	173.9	181.7	174.0
Total ore mined	Mt	47.4	44.5	45.6	47.4	55.5	71.4	79.8	56.1	48.3	56.0
Sulfide Ore Mined (concentration)											
Sulfides ore mined	Mt	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9
Cu head grade	%	0.36	0.35	0.48	0.61	0.61	0.46	0.34	0.35	0.45	0.53
Mo head grade	%	0.019	0.008	0.016	0.025	0.034	0.030	0.009	0.007	0.009	0.013
Oxide/Sulfide Ore Mined (leaching)											
Oxide ore mined	Mt	4.5	1.6	2.7	4.4	12.6	28.5	36.9	13.2	5.4	13.1
Cu head grade	%	0.17	0.16	0.13	0.14	0.15	0.15	0.16	0.16	0.14	0.15
PROCESS PRODUCTION											
Feed to Mill (sulfides)											
Sulfide ore feed	Mt	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9
Cu feed grade	%	0.36	0.35	0.48	0.61	0.61	0.46	0.34	0.35	0.45	0.53
Mo feed grade	%	0.019	0.008	0.016	0.025	0.034	0.030	0.009	0.007	0.009	0.013
Feed to Leach (sulfide/oxide)											
Sulfide/oxide ore feed	Mt	4.5	1.6	2.7	4.4	12.6	28.5	36.9	13.2	5.4	13.1
Cu feed grade	%	0.17	0.16	0.13	0.14	0.15	0.15	0.16	0.16	0.14	0.15
METAL RECOVERY											
Concentration											
Cu recovered	Mlb	296.3	286.2	404.3	511.4	517.3	383.8	279.7	287.4	374.1	443.8
Mo recovered	Mlb	12.5	4.4	9.2	15.5	22.7	20.7	5.5	3.8	5.0	7.6
Leaching											
Cu recovered	Mlb	20.7	17.1	14.5	12.7	12.4	14.4	17.0	16.2	13.2	12.1

Area	Unit	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
PAYABLE METALS											
Cu payable	Mlb	308.3	294.9	406.3	508.1	513.4	386.4	288.5	295.1	375.9	442.1
Mo payable	Mlb	12.5	4.4	9.2	15.5	22.7	20.7	5.5	3.8	5.0	7.6
METAL VALUE											
Cu payable value	US$M	1,029.4	984.6	1,355.3	1,693.6	1,710.7	1,288.8	963.4	985.4	1,253.7	1,473.8
Mo payable value	US$M	124.8	44.0	92.5	155.2	227.3	207.0	54.9	38.2	49.6	76.3
Total Metal Value	**US$M**	**1,154.2**	**1,028.6**	**1,447.8**	**1,848.9**	**1,938.0**	**1,495.8**	**1,018.3**	**1,023.6**	**1,303.3**	**1,550.1**
TREATMENT AND REFINING CHARGES (TC&RCS)											
Cu concentrate TC&RCs	US$M	-	-	(7.2)	(14.6)	(16.9)	(6.8)	-	-	(6.6)	(11.6)
Cu (Ilo) anodes TC&RCs	US$M	(1.1)	(1.0)	(1.3)	(1.5)	(1.5)	(1.2)	(1.0)	(1.0)	(1.2)	(1.3)
Mo concentrate TC&RCs	US$M	(19.8)	(7.0)	(14.7)	(24.7)	(36.1)	(32.9)	(8.7)	(6.1)	(7.9)	(12.1)
Total TC&RCs	**US$M**	**(20.9)**	**(8.0)**	**(23.2)**	**(40.8)**	**(54.5)**	**(40.9)**	**(9.7)**	**(7.1)**	**(15.7)**	**(25.0)**
TRANSPORT COSTS											
SX/EW cathodes transport	US$M	(0.7)	(0.6)	(0.5)	(0.4)	(0.4)	(0.5)	(0.5)	(0.5)	(0.4)	(0.4)
Cu concentrate transport	US$M	-	-	(3.5)	(7.1)	(8.2)	(3.3)	-	-	(3.2)	(5.6)
Ilo anodes transport	US$M	(0.5)	(0.5)	(0.6)	(0.8)	(0.7)	(0.6)	(0.5)	(0.5)	(0.6)	(0.7)
Ilo cathodes transport	US$M	(8.9)	(8.6)	(10.9)	(12.8)	(12.6)	(10.3)	(8.4)	(8.6)	(10.1)	(11.3)
Mo concentrate transport	US$M	(1.1)	(0.4)	(0.8)	(1.4)	(2.1)	(1.9)	(0.5)	(0.3)	(0.4)	(0.7)
Total Transport Costs	**US$M**	**(11.2)**	**(10.0)**	**(16.3)**	**(22.5)**	**(24.1)**	**(16.6)**	**(9.9)**	**(10.0)**	**(14.8)**	**(18.7)**
NET SMELTER RETURN	**US$M**	**1,122.1**	**1,010.5**	**1,408.3**	**1,785.6**	**1,859.4**	**1,438.2**	**998.7**	**1,006.5**	**1,272.8**	**1,506.4**
PRODUCTION COSTS											
Mining	US$M	(472.0)	(475.5)	(477.9)	(460.9)	(484.4)	(475.8)	(483.7)	(479.4)	(484.0)	(483.6)
Process	US$M	(422.9)	(418.8)	(442.3)	(461.7)	(459.7)	(519.8)	(500.8)	(502.8)	(516.9)	(529.0)
G&A	US$M	-	-	-	-	-	-	-	-	-	-

Area	Unit	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Total Production Costs	**US$M**	**(894.8)**	**(894.3)**	**(920.2)**	**(922.6)**	**(944.1)**	**(995.5)**	**(984.5)**	**(982.2)**	**(1,000.8)**	**(1,012.6)**
MMR AND SMT											
Modified Mining Royalty	US$M	(11.3)	(10.2)	(14.2)	(18.1)	(18.8)	(14.5)	(10.1)	(10.2)	(12.9)	(15.3)
Special Mining Tax	US$M	-	-	(5.0)	(17.2)	(19.1)	(4.3)	-	-	(1.4)	(6.7)
MMR and SMT	**US$M**	**(11.3)**	**(10.2)**	**(19.3)**	**(35.2)**	**(37.9)**	**(18.8)**	**(10.1)**	**(10.2)**	**(14.3)**	**(21.9)**
NET OPERATING EARNINGS	**US$M**	**215.9**	**106.1**	**468.9**	**827.8**	**877.4**	**423.9**	**4.1**	**14.2**	**257.7**	**471.8**
TAXES											
Employee profit share	US$M	-	-	(16.9)	(45.9)	(50.1)	(14.6)	-	-	(4.4)	(21.7)
Complementary mining pension fund	US$M	-	-	(1.0)	(2.6)	(2.9)	(0.8)	-	-	(0.3)	(1.2)
Income tax	US$M	-	-	(57.0)	(155.1)	(169.2)	(49.4)	-	-	(15.0)	(73.3)
Total Taxes	**US$M**	**-**	**-**	**(74.9)**	**(203.7)**	**(222.3)**	**(64.8)**	**-**	**-**	**(19.7)**	**(96.3)**
CAPITAL COSTS											
Sustaining capital	US$M	(209.6)	(122.4)	(333.2)	(339.5)	(506.1)	(147.7)	(141.5)	(179.7)	(168.6)	(178.6)
Total Capital Costs	**US$M**	**(209.6)**	**(122.4)**	**(333.2)**	**(339.5)**	**(506.1)**	**(147.7)**	**(141.5)**	**(179.7)**	**(168.6)**	**(178.6)**
CLOSURE COST											
Closure cost	US$M	(1.8)	(1.8)	(1.8)	(1.8)	(2.0)	(1.1)	(0.2)	(0.1)	(0.1)	(0.1)
WORKING CAPITAL											
Change in Working Capital	US$M	42.8	19.3	(64.3)	(62.5)	(11.4)	73.6	73.8	(1.3)	(43.0)	(37.9)
NET CASH FLOW											
Before tax	US$M	47.4	1.2	69.6	424.0	357.9	348.7	(63.9)	(166.9)	46.0	255.3
After tax	US$M	47.4	1.2	(5.3)	220.3	135.6	283.8	(63.9)	(166.9)	26.3	159.0

Note: Numbers have been rounded. Totals may not sum due to rounding.

Table 19-4: Cash Flow Forecast on an Annual Basis (2042–2051)

Item	Unit	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051
MINE PRODUCTION											
Waste mined	Mt	150.9	151.4	172.7	178.3	180.5	186.8	162.3	158.3	151.8	151.1
Total ore mined	Mt	81.5	78.6	57.5	52.6	49.5	43.2	46.3	44.1	48.2	48.9
Sulfide Ore Mined (concentration)											
Sulfides ore mined	Mt	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9
Cu head grade	%	0.59	0.49	0.46	0.36	0.37	0.40	0.45	0.41	0.50	0.59
Mo head grade	%	0.019	0.017	0.020	0.014	0.014	0.019	0.023	0.037	0.011	0.017
Oxide/Sulfide Ore Mined (leaching)											
Oxide ore mined	Mt	38.6	35.6	14.5	9.7	6.5	0.2	3.4	1.2	5.3	5.9
Cu head grade	%	0.15	0.17	0.18	0.16	0.14	0.14	0.14	0.15	0.15	0.15
PROCESS PRODUCTION											
Feed to Mill (sulfides)											
Sulfide ore feed	Mt	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9
Cu feed grade	%	0.59	0.49	0.46	0.36	0.37	0.40	0.45	0.41	0.50	0.59
Mo feed grade	%	0.019	0.017	0.020	0.014	0.014	0.019	0.023	0.037	0.011	0.017
Feed to Leach (sulfide/oxide)											
Sulfide/oxide ore feed	Mt	38.6	35.6	14.5	9.7	6.5	0.2	3.4	1.2	5.3	5.9
Cu feed grade	%	0.15	0.17	0.18	0.16	0.14	0.14	0.14	0.15	0.15	0.15
METAL RECOVERY											
Concentration											
Cu recovered	Mlb	500.2	408.2	385.0	293.7	303.5	333.9	370.7	337.4	414.9	499.2
Mo recovered	Mlb	11.5	10.9	13.0	8.7	8.9	12.7	15.1	25.4	6.2	10.1
Leaching											
Cu recovered	Mlb	14.4	16.9	15.6	13.1	11.1	8.9	7.7	6.7	6.3	6.3

Item	Unit	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051
PAYABLE METALS											
Cu payable	Mlb	499.3	413.1	389.3	298.1	305.7	333.0	367.5	334.1	409.1	490.1
Mo payable	Mlb	11.5	10.9	13.0	8.7	8.9	12.7	15.1	25.4	6.2	10.1
METAL VALUE											
Cu payable value	US$M	1,665.3	1,379.3	1,299.8	995.6	1,020.8	1,111.9	1,227.2	1,115.7	1,365.9	1,634.8
Mo payable value	US$M	114.8	109.0	129.7	87.0	89.1	127.1	150.5	254.0	61.9	101.4
Total Metal Value	**US$M**	**1,780.1**	**1,488.3**	**1,429.5**	**1,082.6**	**1,109.8**	**1,239.0**	**1,377.7**	**1,369.7**	**1,427.8**	**1,736.2**
TREATMENT AND REFINING CHARGES (TC&RCS)											
Cu concentrate TC&RCs	US$M	(8.9)	-	-	-	-	-	-	-	-	(8.9)
Cu (Ilo) anodes TC&RCs	US$M	(1.6)	(1.4)	(1.4)	(1.0)	(1.1)	(1.2)	(1.3)	(1.2)	(1.5)	(1.6)
Mo concentrate TC&RCs	US$M	(18.2)	(17.3)	(20.6)	(13.8)	(14.1)	(20.2)	(23.9)	(40.3)	(9.8)	(16.1)
Total TC&RCs	**US$M**	**(28.7)**	**(18.8)**	**(22.0)**	**(14.9)**	**(15.2)**	**(21.4)**	**(25.2)**	**(41.5)**	**(11.3)**	**(26.6)**
TRANSPORT COSTS											
SX/EW cathodes transport	US$M	(0.5)	(0.5)	(0.5)	(0.4)	(0.4)	(0.3)	(0.2)	(0.2)	(0.2)	(0.2)
Cu concentrate transport	US$M	(4.3)	-	-	-	-	-	-	-	-	(4.3)
Ilo anodes transport	US$M	(0.8)	(0.7)	(0.7)	(0.5)	(0.5)	(0.6)	(0.7)	(0.6)	(0.7)	(0.8)
Ilo cathodes transport	US$M	(13.5)	(12.2)	(11.5)	(8.8)	(9.1)	(10.0)	(11.1)	(10.1)	(12.4)	(13.4)
Mo concentrate transport	US$M	(1.0)	(1.0)	(1.2)	(0.8)	(0.8)	(1.2)	(1.4)	(2.3)	(0.6)	(0.9)
Total Transport Costs	**US$M**	**(20.1)**	**(14.5)**	**(13.9)**	**(10.5)**	**(10.8)**	**(12.0)**	**(13.4)**	**(13.2)**	**(13.9)**	**(19.7)**
NET SMELTER RETURN	**US$M**	**1,731.3**	**1,455.0**	**1,393.7**	**1,057.2**	**1,083.8**	**1,205.6**	**1,339.1**	**1,315.0**	**1,402.6**	**1,689.9**
PRODUCTION COSTS											
Mining	US$M	(503.2)	(472.1)	(467.4)	(488.5)	(486.1)	(492.3)	(464.3)	(458.7)	(451.0)	(452.7)
Process	US$M	(549.8)	(537.7)	(530.3)	(502.1)	(497.5)	(506.8)	(517.9)	(507.7)	(531.0)	(542.5)
G&A	US$M	-	-	-	-	-	-	-	-	-	-
Total Production Costs	**US$M**	**(1,053.0)**	**(1,009.8)**	**(997.7)**	**(990.6)**	**(983.6)**	**(999.1)**	**(982.3)**	**(966.3)**	**(982.1)**	**(995.1)**

Item	Unit	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051
MMR AND SMT											
Modified Mining Royalty	US$M	(17.5)	(14.7)	(14.1)	(10.7)	(10.9)	(12.2)	(13.5)	(13.3)	(14.2)	(17.1)
Special Mining Tax	US$M	(12.2)	(5.1)	(3.8)	-	-	-	(2.4)	(2.3)	(3.9)	(11.9)
MMR and SMT	**US$M**	**(29.7)**	**(19.8)**	**(17.9)**	**(10.7)**	**(10.9)**	**(12.2)**	**(15.9)**	**(15.5)**	**(18.0)**	**(29.0)**
NET OPERATING EARNINGS	**US$M**	**648.5**	**425.4**	**378.1**	**56.0**	**89.3**	**194.3**	**340.9**	**333.1**	**402.5**	**665.7**
Taxes											
Employee profit share	US$M	(35.7)	(17.1)	(13.1)	-	-	-	(8.3)	(7.8)	(13.3)	(34.9)
Complementary mining pension fund	US$M	(2.1)	(1.0)	(0.8)	-	-	-	(0.5)	(0.4)	(0.8)	(2.0)
Income tax	US$M	(120.5)	(57.6)	(44.3)	-	-	-	(28.0)	(26.3)	(44.9)	(117.7)
Total Taxes	**US$M**	**(158.2)**	**(75.7)**	**(58.2)**	**-**	**-**	**-**	**(36.8)**	**(34.6)**	**(59.0)**	**(154.6)**
Capital Costs											
Sustaining capital	US$M	(237.3)	(256.9)	(153.1)	(174.7)	(126.9)	(251.6)	(232.5)	(172.7)	(158.1)	(113.6)
Total Capital Costs	**US$M**	**(237.3)**	**(256.9)**	**(153.1)**	**(174.7)**	**(126.9)**	**(251.6)**	**(232.5)**	**(172.7)**	**(158.1)**	**(113.6)**
Closure Cost											
Closure cost	US$M	(0.1)	-	-	-	-	-	-	-	-	-
Working Capital											
Change in Working Capital	US$M	(33.4)	42.3	8.7	55.0	(5.0)	(19.2)	(23.5)	1.3	(10.5)	(47.0)
Net Cash Flow											
Before tax	US$M	377.7	210.9	233.7	(63.8)	(42.5)	(76.5)	85.0	161.7	233.9	505.2
After tax	US$M	219.4	135.2	175.6	(63.8)	(42.5)	(76.5)	48.1	127.1	174.9	350.6

Note: Numbers have been rounded. Totals may not sum due to rounding.

Table 19-5: Cash Flow Forecast on an Annual Basis (2052–2061)

Item	Unit	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061
MINE PRODUCTION											
Waste mined	Mt	117.6	125.9	131.1	122.3	126.5	125.7	123.0	131.1	100.5	99.0
Total ore mined	Mt	62.4	54.1	55.0	57.7	53.5	54.3	57.0	48.9	45.5	44.3
Sulfide Ore Mined (concentration)											
Sulfides ore mined	Mt	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9
Cu head grade	%	0.62	0.53	0.44	0.37	0.34	0.37	0.40	0.51	0.58	0.59
Mo head grade	%	0.028	0.043	0.039	0.021	0.007	0.009	0.011	0.019	0.035	0.055
Oxide/Sulfide Ore Mined (leaching)											
Oxide ore mined	Mt	19.4	11.1	12.1	14.8	10.6	11.3	14.1	6.0	2.5	1.3
Cu head grade	%	0.15	0.15	0.17	0.17	0.16	0.16	0.18	0.19	0.19	0.12
PROCESS PRODUCTION											
Feed to Mill (sulfides)											
Sulfide ore feed	Mt	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9
Cu feed grade	%	0.62	0.53	0.44	0.37	0.34	0.37	0.40	0.51	0.58	0.59
Mo feed grade	%	0.028	0.043	0.039	0.021	0.007	0.009	0.011	0.019	0.035	0.055
Feed to Leach (sulfide/oxide)											
Sulfide/oxide ore feed	Mt	19.4	11.1	12.1	14.8	10.6	11.3	14.1	6.0	2.5	1.3
Cu feed grade	%	0.15	0.15	0.17	0.17	0.16	0.16	0.18	0.19	0.19	0.12
METAL RECOVERY											
Concentration											
Cu recovered	Mlb	521.5	439.7	365.6	303.2	274.4	305.2	328.4	427.8	485.3	494.1
Mo recovered	Mlb	18.2	30.2	27.2	14.1	3.5	4.8	6.2	11.6	22.9	37.4
Leaching											
Cu recovered	Mlb	7.6	7.9	7.7	8.3	8.2	7.8	7.9	7.1	5.8	4.6

Item	Unit	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061
PAYABLE METALS											
Cu payable	Mlb	513.1	434.6	362.5	302.6	274.6	304.0	326.7	421.8	476.0	483.3
Mo payable	Mlb	18.2	30.2	27.2	14.1	3.5	4.8	6.2	11.6	22.9	37.4
METAL VALUE											
Cu payable value	US$M	1,711.4	1,451.4	1,210.5	1,010.3	916.9	1,015.1	1,090.8	1,407.0	1,587.2	1,611.0
Mo payable value	US$M	181.7	302.0	271.7	141.5	34.9	48.5	61.7	115.9	229.4	373.9
Total Metal Value	**US$M**	**1,893.1**	**1,753.3**	**1,482.2**	**1,151.8**	**951.9**	**1,063.5**	**1,152.5**	**1,522.9**	**1,816.5**	**1,984.9**
TREATMENT AND REFINING CHARGES (TC&RCS)											
Cu concentrate TC&RCs	US$M	(9.3)	-	-	-	-	-	-	(7.6)	(11.6)	(13.5)
Cu (Ilo) anodes TC&RCs	US$M	(1.7)	(1.6)	(1.3)	(1.1)	(1.0)	(1.1)	(1.2)	(1.4)	(1.5)	(1.5)
Mo concentrate TC&RCs	US$M	(28.9)	(48.0)	(43.1)	(22.5)	(5.6)	(7.7)	(9.8)	(18.4)	(36.4)	(59.4)
Total TC&RCs	**US$M**	**(39.8)**	**(49.5)**	**(44.4)**	**(23.5)**	**(6.5)**	**(8.8)**	**(11.0)**	**(27.4)**	**(49.5)**	**(74.3)**
TRANSPORT COSTS											
SX/EW cathodes transport	US$M	(0.2)	(0.3)	(0.2)	(0.3)	(0.3)	(0.3)	(0.3)	(0.2)	(0.2)	(0.1)
Cu concentrate transport	US$M	(4.5)	-	-	-	-	-	-	(3.7)	(5.6)	(6.6)
Ilo anodes transport	US$M	(0.8)	(0.8)	(0.6)	(0.5)	(0.5)	(0.5)	(0.6)	(0.7)	(0.7)	(0.7)
Ilo cathodes transport	US$M	(14.0)	(13.2)	(10.9)	(9.1)	(8.2)	(9.1)	(9.8)	(11.5)	(12.6)	(12.5)
Mo concentrate transport	US$M	(1.6)	(2.7)	(2.5)	(1.3)	(0.3)	(0.4)	(0.6)	(1.0)	(2.1)	(3.4)
Total Transport Costs	**US$M**	**(21.3)**	**(16.9)**	**(14.3)**	**(11.2)**	**(9.3)**	**(10.4)**	**(11.2)**	**(17.2)**	**(21.2)**	**(23.3)**
NET SMELTER RETURN	**US$M**	**1,832.0**	**1,686.9**	**1,423.4**	**1,117.1**	**936.0**	**1,044.4**	**1,130.3**	**1,478.4**	**1,745.8**	**1,887.2**
PRODUCTION COSTS											
Mining	US$M	(403.6)	(400.5)	(401.2)	(405.3)	(388.1)	(414.9)	(424.3)	(381.2)	(342.5)	(347.5)
Process	US$M	(556.7)	(547.4)	(524.6)	(505.5)	(496.6)	(506.0)	(513.2)	(530.4)	(541.1)	(540.4)
G&A	US$M	-	-	-	-	-	-	-	-	-	-
Total Production Costs	**US$M**	**(960.3)**	**(947.9)**	**(925.8)**	**(910.8)**	**(884.7)**	**(920.9)**	**(937.5)**	**(911.6)**	**(883.6)**	**(887.9)**

Item	Unit	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061
MMR AND SMT											
Modified Mining Royalty	US$M	(18.5)	(17.0)	(14.4)	(11.3)	(9.5)	(10.5)	(11.4)	(15.0)	(22.8)	(29.5)
Special Mining Tax	US$M	(18.7)	(14.4)	(7.1)	(0.5)	-	-	(1.1)	(11.5)	(22.9)	(28.6)
MMR and SMT	**US$M**	**(37.2)**	**(31.5)**	**(21.5)**	**(11.8)**	**(9.5)**	**(10.5)**	**(12.5)**	**(26.5)**	**(45.7)**	**(58.1)**
NET OPERATING EARNINGS	**US$M**	**834.5**	**707.5**	**476.1**	**194.5**	**41.9**	**113.0**	**180.3**	**540.3**	**816.4**	**941.2**
TAXES											
Employee profit share	US$M	(49.2)	(40.0)	(22.6)	(1.1)	-	-	(3.3)	(32.7)	(55.2)	(65.1)
Complementary mining pension fund	US$M	(2.8)	(2.3)	(1.3)	(0.1)	-	-	(0.2)	(1.9)	(3.2)	(3.7)
Income tax	US$M	(166.1)	(134.9)	(76.3)	(3.8)	-	-	(11.2)	(110.5)	(186.3)	(219.9)
Total Taxes	**US$M**	**(218.2)**	**(177.2)**	**(100.2)**	**(5.0)**	**-**	**-**	**(14.7)**	**(145.1)**	**(244.7)**	**(288.8)**
CAPITAL COSTS											
Sustaining capital	US$M	(130.1)	(120.4)	(121.8)	(162.7)	(146.7)	(109.0)	(145.0)	(83.1)	(120.5)	(128.2)
Total Capital Costs	**US$M**	**(130.1)**	**(120.4)**	**(121.8)**	**(162.7)**	**(146.7)**	**(109.0)**	**(145.0)**	**(83.1)**	**(120.5)**	**(128.2)**
CLOSURE COST											
Closure cost	US$M	-	-	-	-	-	-	-	-	-	-
WORKING CAPITAL											
Change in Working Capital	US$M	(26.8)	21.9	41.3	50.3	29.0	(15.0)	(12.8)	(60.0)	(46.8)	(24.1)
NET CASH FLOW											
Before tax	US$M	677.6	609.0	395.6	82.0	(75.8)	(11.1)	22.4	397.1	649.1	789.0
After tax	US$M	459.5	431.8	295.4	77.0	(75.8)	(11.1)	7.7	252.0	404.4	500.2

Note: Numbers have been rounded. Totals may not sum due to rounding.

Table 19-6: Cash Flow Forecast on an Annual Basis (2062–2071)

Item	Unit	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071
MINE PRODUCTION											
Waste mined	Mt	90.5	94.7	62.8	28.5	4.5	0.9	0.1	0.1	-	0.5
Total ore mined	Mt	52.2	65.7	71.2	58.9	45.4	46.6	46.6	49.0	43.1	42.9
Sulfide Ore Mined (concentration)											
Sulfides ore mined	Mt	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9
Cu head grade	%	0.48	0.36	0.27	0.30	0.33	0.38	0.45	0.53	0.57	0.52
Mo head grade	%	0.055	0.033	0.003	0.003	0.004	0.006	0.010	0.020	0.038	0.045
Oxide/Sulfide Ore Mined (leaching)											
Oxide ore mined	Mt	9.2	22.8	28.3	16.0	2.5	3.7	3.7	6.1	0.2	-
Cu head grade	%	0.15	0.16	0.18	0.19	0.19	0.20	0.18	0.18	0.17	-
PROCESS PRODUCTION											
Feed to Mill (sulfides)											
Sulfide ore feed	Mt	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9
Cu feed grade	%	0.48	0.36	0.27	0.30	0.33	0.38	0.45	0.53	0.57	0.52
Mo feed grade	%	0.055	0.033	0.003	0.003	0.004	0.006	0.010	0.020	0.038	0.045
Feed to Leach (sulfide/oxide)											
Sulfide/oxide ore feed	Mt	9.2	22.8	28.3	16.0	2.5	3.7	3.7	6.1	0.2	-
Cu feed grade	%	0.15	0.16	0.18	0.19	0.19	0.20	0.18	0.18	0.17	-
METAL RECOVERY											
Concentration											
Cu recovered	Mlb	398.7	300.4	221.4	245.2	269.6	309.2	376.5	447.8	479.5	438.6
Mo recovered	Mlb	38.9	22.8	1.4	1.4	2.0	3.1	5.7	12.1	25.0	30.1
Leaching											
Cu recovered	Mlb	4.8	7.1	10.1	10.7	8.7	7.0	6.1	5.9	4.9	-

Item	Unit	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071
PAYABLE METALS											
Cu payable	Mlb	391.4	298.7	225.0	248.7	270.4	307.1	371.6	440.6	470.4	425.7
Mo payable	Mlb	38.9	22.8	1.4	1.4	2.0	3.1	5.7	12.1	25.0	30.1
METAL VALUE											
Cu payable value	US$M	1,305.4	997.3	751.3	830.5	902.8	1,025.4	1,240.7	1,471.2	1,570.7	1,421.4
Mo payable value	US$M	389.4	228.0	14.3	13.6	20.2	31.1	57.4	120.5	249.8	301.4
Total Metal Value	**US$M**	1,694.8	1,225.3	765.7	844.1	922.9	1,056.6	1,298.1	1,591.7	1,820.5	1,722.8
TREATMENT AND REFINING CHARGES (TC&RCS)											
Cu concentrate TC&RCs	US$M	(7.1)	-	-	-	-	-	-	-	-	-
Cu (Ilo) anodes TC&RCs	US$M	(1.3)	(1.1)	(0.8)	(0.9)	(1.0)	(1.1)	(1.3)	(1.6)	(1.7)	(1.6)
Mo concentrate TC&RCs	US$M	(61.8)	(36.2)	(2.3)	(2.2)	(3.2)	(4.9)	(9.1)	(19.1)	(39.7)	(47.9)
Total TC&RCs	**US$M**	(70.2)	(37.3)	(3.1)	(3.0)	(4.2)	(6.0)	(10.5)	(20.7)	(41.4)	(49.4)
TRANSPORT COSTS											
SX/EW cathodes transport	US$M	(0.2)	(0.2)	(0.3)	(0.3)	(0.3)	(0.2)	(0.2)	(0.2)	(0.2)	-
Cu concentrate transport	US$M	(3.4)	-	-	-	-	-	-	-	-	-
Ilo anodes transport	US$M	(0.6)	(0.5)	(0.4)	(0.4)	(0.5)	(0.5)	(0.7)	(0.8)	(0.9)	(0.8)
Ilo cathodes transport	US$M	(10.7)	(9.0)	(6.6)	(7.3)	(8.1)	(9.2)	(11.3)	(13.4)	(14.3)	(13.1)
Mo concentrate transport	US$M	(3.5)	(2.1)	(0.1)	(0.1)	(0.2)	(0.3)	(0.5)	(1.1)	(2.3)	(2.7)
Total Transport Costs	**US$M**	(18.5)	(11.8)	(7.5)	(8.2)	(9.0)	(10.3)	(12.7)	(15.5)	(17.6)	(16.6)
NET SMELTER RETURN	**US$M**	***1,606.1***	***1,176.2***	***755.1***	***832.9***	***909.8***	***1,040.2***	***1,275.0***	***1,555.5***	***1,761.5***	***1,656.7***
PRODUCTION COSTS											
Mining	US$M	(343.5)	(379.7)	(319.6)	(202.9)	(113.7)	(109.6)	(107.6)	(115.0)	(102.9)	(105.6)
Process	US$M	(522.3)	(504.8)	(480.8)	(487.8)	(494.9)	(507.0)	(527.7)	(549.7)	(559.3)	(512.4)
G&A	US$M	-	-	-	-	-	-	-	-	-	-
Total Production Costs	**US$M**	(865.8)	(884.5)	(800.4)	(690.7)	(608.6)	(616.6)	(635.3)	(664.7)	(662.2)	(618.0)

Item	Unit	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071
MMR AND SMT											
Modified Mining Royalty	US$M	(16.8)	(11.9)	(7.6)	(8.4)	(9.2)	(10.5)	(15.2)	(27.7)	(38.8)	(36.7)
Special Mining Tax	US$M	(17.8)	(3.2)	-	(0.2)	(3.7)	(7.5)	(15.6)	(26.0)	(34.8)	(32.9)
MMR and SMT	**US$M**	(34.6)	(15.1)	(7.6)	(8.6)	(12.9)	(18.0)	(30.8)	(53.8)	(73.6)	(69.6)
NET OPERATING EARNINGS	**US$M**	705.6	276.6	(52.9)	133.6	288.3	405.6	608.9	837.0	1,025.6	969.1
TAXES											
Employee profit share	US$M	(45.6)	(11.1)	-	-	(12.2)	(21.8)	(38.6)	(57.0)	(71.3)	(67.3)
Complementary mining pension fund	US$M	(2.6)	(0.6)	-	-	(0.7)	(1.3)	(2.2)	(3.3)	(4.1)	(3.9)
Income tax	US$M	(153.9)	(37.4)	-	-	(41.3)	(73.5)	(130.2)	(192.5)	(240.8)	(227.1)
Total Taxes	**US$M**	(202.1)	(49.1)	-	-	(54.3)	(96.6)	(171.0)	(252.8)	(316.3)	(298.2)
CAPITAL COSTS											
Sustaining capital	US$M	(199.3)	(147.8)	(124.3)	(116.2)	(108.2)	(97.2)	(63.5)	(67.3)	(81.4)	(57.5)
Total Capital Costs	**US$M**	(199.3)	(147.8)	(124.3)	(116.2)	(108.2)	(97.2)	(63.5)	(67.3)	(81.4)	(57.5)
CLOSURE COST											
Closure cost	US$M	-	-	-	-	(5.7)	(5.8)	(5.9)	(5.8)	(20.4)	(20.4)
WORKING CAPITAL											
Change in Working Capital	US$M	43.2	73.9	64.9	(21.8)	(19.2)	(20.6)	(36.6)	(42.9)	(34.3)	12.7
NET CASH FLOW											
Before tax	US$M	549.6	202.7	(112.3)	(4.3)	155.2	281.9	502.9	721.0	889.5	903.9
After tax	US$M	347.5	153.5	(112.3)	(4.3)	100.9	185.4	331.9	468.1	573.2	605.7

Note: Numbers have been rounded. Totals may not sum due to rounding.

Table 19-7: Cash Flow Forecast on an Annual Basis (2072–2080)

Item	Unit	2072	2073	2074	2075	2076	2077	2078	2079	2080
MINE PRODUCTION										
Waste mined	Mt	0.4	-	-	-	-	-	-	-	-
Total ore mined	Mt	42.6	0.5	-	-	-	-	-	-	-
Sulfide Ore Mined (concentration)										
Sulfides ore mined	Mt	42.6	0.5	-	-	-	-	-	-	-
Cu head grade	%	0.50	0.67	-	-	-	-	-	-	-
Mo head grade	%	0.037	0.029	-	-	-	-	-	-	-
Oxide/Sulfide Ore Mined (leaching)										
Oxide ore mined	Mt	-	-	-	-	-	-	-	-	-
Cu head grade	%	-	-	-	-	-	-	-	-	-
PROCESS PRODUCTION										
Feed to Mill (sulfides)										
Sulfide ore feed	Mt	42.6	0.5	-	-	-	-	-	-	-
Cu feed grade	%	0.50	0.67	-	-	-	-	-	-	-
Mo feed grade	%	0.037	0.029	-	-	-	-	-	-	-
Feed to Leach (sulfide/oxide)										
Sulfide/oxide ore feed	Mt	-	-	-	-	-	-	-	-	-
Cu feed grade	%	-	-	-	-	-	-	-	-	-
METAL RECOVERY										
Concentration										
Cu recovered	Mlb	413.3	6.6	-	-	-	-	-	-	-
Mo recovered	Mlb	24.7	0.2	-	-	-	-	-	-	-
Leaching										
Cu recovered	Mlb	-	-	-	-	-	-	-	-	-

Item	Unit	2072	2073	2074	2075	2076	2077	2078	2079	2080
PAYABLE METALS										
Cu payable	Mlb	401.1	6.4	-	-	-	-	-	-	-
Mo payable	Mlb	24.7	0.2	-	-	-	-	-	-	-
METAL VALUE										
Cu payable value	US$M	1,339.3	21.3	-	-	-	-	-	-	-
Mo payable value	US$M	246.8	2.2	-	-	-	-	-	-	-
Total Metal Value	**US$M**	**1,586.1**	**23.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
TREATMENT AND REFINING CHARGES (TC&RCS)										
Cu concentrate TC&RCs	US$M	-	-	-	-	-	-	-	-	-
Cu (Ilo) anodes TC&RCs	US$M	(1.5)	(0.0)	-	-	-	-	-	-	-
Mo concentrate TC&RCs	US$M	(39.2)	(0.3)	-	-	-	-	-	-	-
Total TC&RCs	**US$M**	**(40.7)**	**(0.4)**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
TRANSPORT COSTS										
SX/EW cathodes transport	US$M	-	-	-	-	-	-	-	-	-
Cu concentrate transport	US$M	-	-	-	-	-	-	-	-	-
Ilo anodes transport	US$M	(0.7)	(0.0)	-	-	-	-	-	-	-
Ilo cathodes transport	US$M	(12.4)	(0.2)	-	-	-	-	-	-	-
Mo concentrate transport	US$M	(2.2)	(0.0)	-	-	-	-	-	-	-
Total Transport Costs	**US$M**	**(15.3)**	**(0.2)**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
NET SMELTER RETURN	**US$M**	**1,530.1**	**22.9**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
PRODUCTION COSTS										
Mining	US$M	(108.1)	(4.8)	-	-	-	-	-	-	-
Process	US$M	(501.8)	(6.4)	-	-	-	-	-	-	-
G&A	US$M	-	-	-	-	-	-	-	-	-
Total Production Costs	**US$M**	**(609.9)**	**(11.3)**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Item	Unit	2072	2073	2074	2075	2076	2077	2078	2079	2080
MMR AND SMT										
Modified Mining Royalty	US$M	(31.1)	(0.2)	-	-	-	-	-	-	-
Special Mining Tax	US$M	(28.4)	-	-	-	-	-	-	-	-
MMR and SMT	**US$M**	**(59.5)**	**(0.2)**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
NET OPERATING EARNINGS	**US$M**	**860.7**	**11.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
TAXES										
Employee profit share	US$M	(59.6)	-	-	-	-	-	-	-	-
Complementary mining pension fund	US$M	(3.4)	-	-	-	-	-	-	-	-
Income tax	US$M	(201.3)	-	-	-	-	-	-	-	-
Total Taxes	**US$M**	**(264.4)**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CAPITAL COSTS										
Sustaining capital	US$M	(56.1)	-	-	-	-	-	-	-	-
Total Capital Costs	**US$M**	**(56.1)**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Closure Cost										
Closure cost	US$M	(22.8)	(216.9)	(24.0)	(1.2)	(2.0)	(0.9)	(1.9)	(7.2)	-
Working Capital										
Change in Working Capital	US$M	20.1	198.2	2.9	-	-	-	-	-	-
Net Cash Flow										
Before tax	US$M	802.0	(7.2)	(21.2)	(1.2)	(2.0)	(0.9)	(1.9)	(7.2)	-
After tax	US$M	537.6	(7.2)	(21.2)	(1.2)	(2.0)	(0.9)	(1.9)	(7.2)	-

Note: Numbers have been rounded. Totals may not sum due to rounding.

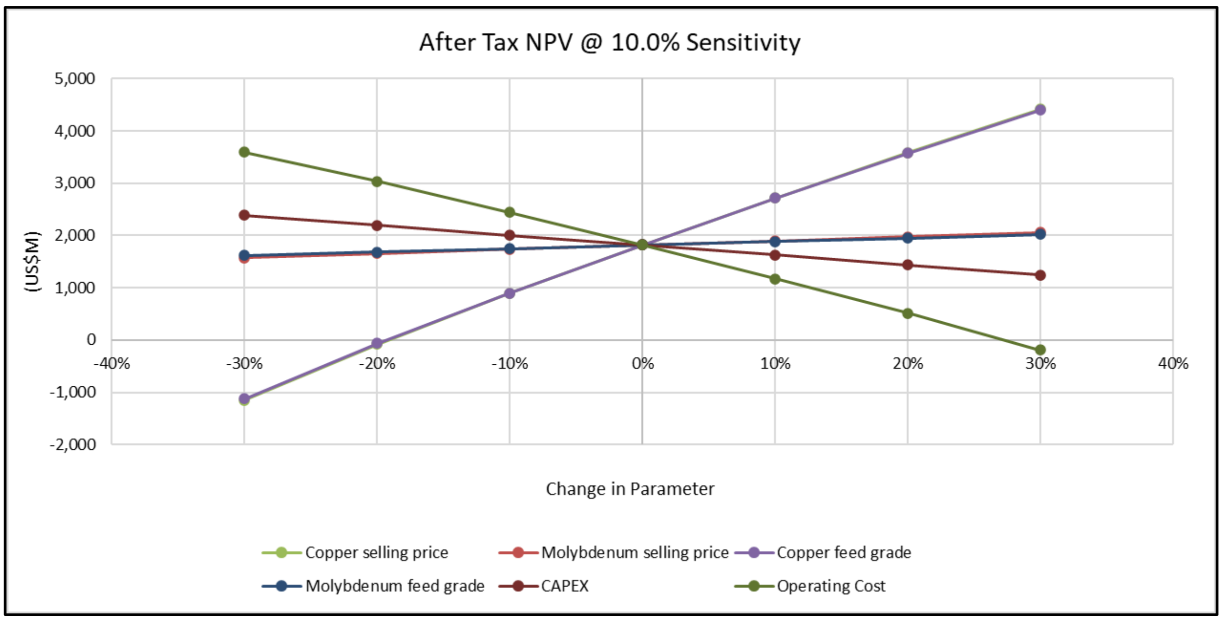
19.5 Sensitivity Analysis

A sensitivity analysis was performed to identify potential impacts on the after-tax NPV of variations in metal prices, grades, sustaining capital costs and operating costs. The results of this analysis are presented in Figure 19-1 (NPV). For the purpose of the sensitivity to metal grades, it was assumed that the capacity of the processing facilities is not a constraint.

The Toquepala Operations are most sensitive to fluctuations in copper price and grade. It is less sensitive to changes in operating costs and capital costs. The operations are least sensitive to variations in molybdenum price and grade.

Table 19-8 presents the Toquepala operation after-tax NPV at a range of discount rates from 8–12% with the base case highlighted.

Figure 19-1: After-Tax NPV Sensitivity (10% discount rate)



(Source: Wood, 2022)

Table 19-8: After-Tax NPV Sensitivity to Discount Rates (base case is highlighted)

Discount Rate	After-Tax NPV (US$M)
NPV @ 8%	2,182.5
NPV @ 9%	1,981.7
NPV @ 10%	**1,818.1**
NPV @ 11%	1,682.2
NPV @ 12%	1,567.2

20.0 ADJACENT PROPERTIES

This Chapter is not relevant to this Report.

21.0 OTHER RELEVANT DATA AND INFORMATION

There is no additional information or explanation necessary to provide a complete and balanced presentation of the value of the Property to Southern Copper.

22.0 INTERPRETATION AND CONCLUSIONS

22.1 Introduction

The Wood QPs note the following interpretations and conclusions, based on their analysis of the data available for this Report.

22.2 Mineral Tenure, Surface Rights, Water Rights, Royalties and Agreements

The Toquepala Operations and the Ilo smelter/refinery are owned and operated by Southern Peru Copper Corporation, Sucursal del Perú.

The Project consists of 14 mining concessions totaling 24,280 ha. Southern Copper also holds two beneficiation concessions.

Southern Copper holds a "right of free use" granted by the Peruvian State on the uncultivated lands in the Toquepala mining concession and Quebrada Honda TSF areas. This surface right will be maintained as long as the mining concessions remains in force.

There are granted easements covering the TSF and related facilities, the TSF pipelines, and water pipelines from the Suches lagoon to the Toquepala Operations, which have expiry dates that range from 2058–2060.

Southern Copper has both groundwater and surface water usage licences in place.

A mining royalty is payable to the Government of Peru, based on operating income margins with graduated rates ranging from 1–12% of operating profits, with a minimum 1% NSR payable. There is also a mining tax payable, based on operating income, with rates that range from 2-8.4%.

22.3 Geology and Mineralization

The Toquepala deposit is considered to be an example of a copper–molybdenum porphyry deposit.

The geological understanding of the settings, lithologies, and structural and alteration controls on mineralization is sufficient to support estimation of mineral resources.

22.4 Exploration, Drilling, and Sampling

The mine has been operating since 1960, and all exploration data generated prior to mine start-up is long superseded by mining and drill data.

Drilling totals 1,347 core and RC holes (486,548 m). Drilling that supports mineral resource estimation consists of 1,037 core holes for 377,592 m. RC, geotechnical, and blasthole drilling are not used in estimation support. No material factors were identified with the data collection from the drill programs that could significantly affect mineral resource estimation.

The term "true thickness" is not generally applicable to porphyry-style deposits as the entire rock mass is potentially mineralized and there is often no preferred orientation to the mineralization. In areas that display porphyry-style mineralization, in general, most drill holes intersect mineralized zones at an angle, and the drill hole intercept widths reported for those drill holes are typically greater than the true widths of the mineralization at the drill intercept point.

Sampling methods, sample preparation, analysis and security were acceptable for mineral resource estimation. The collected sample data adequately reflect deposit dimensions, true widths of mineralization, and the style of the deposits. Sampling is representative of the copper and molybdenum grades.

No systematic quality control procedure was used to provide quality assurance for assaying prior to 2016. There is a significant evolution in data acquisition and data quality control practices in the different drill campaigns in the Toquepala database. Comparison of data from the 2016-2019 drill programs with earlier data from prior programs resulted in the conclusion that the means of copper and molybdenum grades of adjacent drill hole intersections are comparable over tens of meters, and that analyses performed in the earlier drill campaigns are not significantly biased.

The current assay quality control program for the Toquepala site includes the insertion of field duplicate, pulp duplicate, standards, coarse blank, fine blank and check samples. Wood QPs reviewed the available data and found no material issues with assay quality.

22.5 Data Verification

Wood QPs are of the opinion that the data verification programs for Project data adequately support the geological interpretations, the analytical and database quality, and therefore support the use of the data in mineral resource and mineral reserve estimation.

22.6 Metallurgical Testwork

Metallurgical testwork and associated analytical procedures were appropriate to the mineralization type, appropriate to establish the optimal processing routes, and were performed using samples that are typical of the mineralization styles found within the deposit to be mined by open pit methods.

Samples selected for testing were representative of the various types and styles of mineralization. Samples were selected from a range of depths within the deposit.

Recovery factors estimated are based on appropriate metallurgical testwork and are appropriate to the mineralization types and the selected process routes.

The copper and molybdenum concentrates produced are considered clean concentrates as they do not contain significant amounts of any deleterious elements.

22.7 Mineral Resource Estimates

The mineral resource estimate for the Project conform to industry-accepted practices and is reported using the standards and definitions set out in S-K 1300. Mineral resources were classified to a maximum confidence category of indicated. There are no measured mineral resources estimated for the Project.

There is upside potential for the estimates if mineralization that is currently classified as inferred can be upgraded to higher-confidence mineral resource categories.

Areas of uncertainty that may materially impact all of the mineral resource estimates include: changes to long-term metal price and exchange rate assumptions; changes in local interpretations of mineralization geometry such as presence of unrecognized mineralization off-shoots; faults, dikes and other structures; and continuity of mineralized zones; changes to geological and grade shape, and geological and grade continuity assumptions; changes to metallurgical recovery assumptions; changes to the input assumptions used to derive the conceptual open pit shell that is used to constrain the estimates; changes to the cut-off values applied to the estimates; variations in geotechnical (including seismicity), hydrogeological and mining assumptions; and changes to environmental, permitting and social license assumptions.

22.8 Mineral Reserve Estimates

The mineral reserve estimate for the Project conforms to industry-accepted practices and is reported using the definitions set out in S-K 1300. Mineral reserves were converted from indicated mineral resources, assuming conventional open pit mining methods and use of conventional equipment. Mineral resources were converted to mineral reserves by using a detailed mine plan, an engineering analysis, and consideration of appropriate modifying factors within a mining study that is at least at a prefeasibility level.

Areas of uncertainty that may materially impact the mineral reserve estimates include: changes to long-term metal price and exchange rate assumptions; changes to metallurgical recovery assumptions; changes to the input assumptions used to derive the mineable shapes applicable to the open pit mining methods used to constrain the estimates; changes to the forecast dilution and mining recovery assumptions; changes to the NSR cut-off values applied to the estimates; variations in geotechnical (including seismicity), hydrogeological and mining assumptions; and changes to environmental, permitting and social license assumptions.

22.9 Mining Methods

Open pit operations are conducted using conventional methods and a conventional truck and shovel fleet. Open pit mining operations are conducted year-round.

The mine plans are based on the current knowledge of geotechnical, hydrological, mining and processing information.

Seven pit phases remain in the life-of-mine (LOM) plan, starting with phase 5 and ending with phase 11. Three pit phases will be operational at any one time, to ensure that production rates can be met. A maximum mining capacity per phase of 200 Mt/a is assumed, with a maximum vertical advance rate of 10 benches per year. The mine plan assumed a maximum mining capacity of 260 Mt of annual movement and a nominal processing rate of 120 kt/d of sulfide ore at the concentrator and 140 kt/d of leachable material at the leach facility.

22.10 Recovery Methods

The processing methods are conventional to the industry. The comminution and recovery processes are widely used with no significant elements of technological innovation.

The process plant flowsheet designs were based on testwork results, previous study designs and industry-standard practices.

The LESDE plant has an annual production capacity of 56,336 t of cathode copper, and includes conventional processes used for the recovery of copper such as acidic leaching of low-grade dumps, SX and EW facilities.

The ore in both concentrators is treated in a conventional concentration circuit consisting of crushing, grinding and flotation of copper and molybdenum minerals. The copper concentrate is transported by rail to the Ilo Smelter for treatment and the molybdenum concentrate is bagged and sold as a final product.

The process plants will produce variations in recovery due to the day-to-day changes in ore type or combinations of ore type being processed. These variations are expected to trend to the forecast recovery value for monthly or longer reporting periods.

The Ilo smelter processes the copper concentrates from the Cuajone and Toquepala concentrators and produces copper anodes for the Ilo refinery. The Ilo refinery has the capacity to produce 125,000 kg Ag, 840 kg Au, and 50,000 kg Se annually.

22.11 Infrastructure

Infrastructure required to support open pit mining operations is in place.

The remaining capacity in the Quebrada Honda TSF will support operations until approximately the end of 2036. Southern Copper is currently evaluating alternatives of TSF expansions or new disposal methods to accommodate additional tailings after the Quebrada Honda TSF reaches its ultimate capacity.

For this assessment, it was assumed that, once the existing Quebrada Honda TSF reaches its ultimate storage capacity, the Toquepala Operations will dispose filtered tailings in a standalone dry stack facility to be located near the Quebrada Honda TSF area, as limited space is available on the Toquepala site. Costs have been included as part of the capital and operating cost estimates to account for additional infrastructure and land acquisition required, and the Wood QPs considers there to be adequate time to finalize designs, permit construction, and commission the additional TSF capacity before it is needed.

22.12 Market Studies

The marketing approach is consistent with what is publicly available on industry norms, and the information can be used in mine planning and financial analyses for the products from the Cuajone Operations in the context of this Report.

The principal payable commodities within the concentrates from the Toquepala Operations are copper and molybdenum. The cathodes, anodes, and by-products produced at the Ilo smelter and refinery are considered by Southern Copper to be readily marketable. The Ilo smelter and refinery has historically produced by-product silver, gold and selenium and minor amounts of platinum and palladium. However, these elements have not been included in the mineral resource or mineral reserve estimates and any revenues or costs associated with these metals have been excluded from the production schedule, the cut-off determinations, and cash flow analysis.

Southern Copper employs a corporate strategy that is in line with the company's marketing experience, and experience with obtaining long-term contracts with strategic business partners in the Asian and European markets, as well as annual contracts with other active market participants.

Depending on concentrate quality, the concentrates are primarily sold onto Asian or European market. Normally over 60% of the molybdenum concentrate is sold to Chile, with the remainder sold into the Northern Europe, Asia, and the US markets. Cathode copper is sold onto the Asian, European, Brazilian and/or North American markets.

Southern Copper provided Wood with Southern Copper's internal price forecast and a presentation on their market outlook in the form of a slide deck. The commodity price forecast covered the period 2022-2026 and provided a long-term forecast for 2026 onward. Forecasts were based on Southern Copper's interpretations of market analysis from Wood Mackenzie, CRU and 23 analysts and banks on copper price, and six analysts and banks on molybdenum price.

Wood reviewed the Southern Copper long-term forecast price for copper of US$3.30/lb, and concluded that the copper price selected by Southern Copper is reasonable for the remaining 50 years of mine production, and provides a positive net present value supporting the mineral reserves.

It is industry-accepted practice to use higher forecast metal prices for the mineral resource estimates than the forecast price used for mineral reserves and the cash flow analysis. The higher metal price assumptions for mineral resources helps ensure that the mineral reserves are a sub-set of the mineral resources. The long-term copper price forecast of US$3.30/lb for mineral reserves was increased by 15% to provide the mineral resource estimate long-term copper price forecast of US$3.80/lb which was fixed over the 50-year mine life.

Wood reviewed the Southern Copper long term forecast price for molybdenum of US$10.00/lb, and concluded that the molybdenum price selected by Southern Copper is reasonable compared to what Southern Copper's peers have recently been using in the mining industry. The US$10.00/lb molybdenum price was fixed over the 50-year remaining mine life for the mineral reserves and in the economic analysis. The Southern Copper molybdenum price forecast of US$10.00/lb was increased by 15% to US$11.50/lb to provide the input to the mineral resource constraining pit shell and NSR cut-off.

Mineral reserves and mineral resources were constrained by pit shells that used inputs from copper and molybdenum only, with no gold or silver contribution to the NSR value determinations since gold and silver has not been included in the mineral resource or mineral reserve estimates. The economic analysis also excluded the contribution from gold and silver.

Toquepala Operations concentrates are sent to the Ilo Smelter and Refinery for processing to produce refined cathodes. When the production from Toquepala Operations exceeds the smelter's capacity, a portion is sold to third parties. In recent years, these sales to third parties Toquepala Operations concentrates have represented about 20–25% of the annual production. Approximately 95% of the production of refined cathodes is sold under annual contracts with industrial customers (mainly copper rod producers), with whom Southern Copper has had a commercial relationship for many years, and about 5% is sold on the spot market.

The largest in-place contracts other than for product sales cover items such as bulk commodities, operational and technical services, mining and process equipment, and administrative support services. Contracts are negotiated and renewed as needed. Contract terms are typical of similar contracts that Southern Copper has entered into in Peru.

22.13 Environmental, Permitting and Social Considerations

Baseline and supporting studies were completed in support of current and proposed mine designs, operations, and permitting.

As per permit requirements, Southern Copper has a number of monitoring programs in place.

The current closure plan was completed in January 2022, and cost estimates were escalated to Q3 2022 for this assessment. The current closure cost estimate for the Toquepala Operations, as at Q3 2022, is US$196.5 million, including general sales tax. For this assessment, the Quebrada Honda TSF closure costs and the Ilo Smelter and Refinery closure costs were allocated to the Cuajone and Toquepala Operations proportionally to tailings production throughputs of each and the total LOM concentrate fed by each mine, respectively. A provision was included to account for the closure cost of the filtered tailings plant and dry-stack facility assumed. The total closure cost estimate assumed in the economic analysis is US$355.7 million, inclusive of general sales tax.

The Toquepala Operations and the Ilo Smelter and Refinery have all of the required permits to operate. The operations maintain a permit register.

Portions of the proposed WRSFs that support the mine plan are outside the area that Southern Copper currently holds under surface rights. Additional surface rights, as well as the respective permits and/or assignment of the mining concessions will need to be secured to support the planned WRSFs expansion and new TSF. Wood considers there to be adequate time for this activity to be completed before the additional WRSF capacity is required.

Southern Copper has communication channels and tools in place, based on the company's community development model, which allow the company to recognize potential conflicts early, to work with the community to find appropriate solutions to address their concerns, and generate and maintain positive social license conditions for the continued operation of Southern Copper's mining projects. Wood considers that social risks to the Project are well understood by Southern Copper and have processes in place to reasonably manage those risks.

22.14 Capital Cost Estimates

Capital cost estimates are at a minimum at a pre-feasibility level of confidence, having an accuracy range of ±25% and a contingency amount not exceeding 15%.

The sustaining capital cost estimate totals US$8,739.0 million, excluding value-added tax.

22.15 Operating Cost Estimates

Operating cost estimates are at a minimum at a pre-feasibility level of confidence, having an accuracy range of ±25% and a contingency amount not exceeding 15%.

The operating cost estimate for the LOM is US$44,971.5 million, excluding value-added tax.

22.16 Economic Analysis

The financial analysis was performed using a DCF method. Net annual cash flows were estimated projecting yearly cash inflows (or revenues) and subtracting projected yearly cash outflows (such as capital and operating costs, and taxes).

The financial analysis was based on an after-tax discount rate of 10%. Cash flows were assumed to occur at the end of each year and were be discounted to the beginning of 2023 (Year 1 of the economic analysis). Costs projected within the cash flows are based on constant Q3 2022 US dollars. Revenue was calculated from the recoverable metal and the long-term forecasts of metal prices and exchange rates. Recoverable metal and products include those recovered at the Ilo smelter and refinery from the copper concentrate feed from the mine operation.

The Toquepala Operations are anticipated to generate a pre-tax NPV of US$3,018.5 million at a 10% discount rate and an after-tax NPV of US$1,818.1 million at a 10% discount rate.

As the mine is operating, considerations of IRR and payback are not relevant.

The Toquepala Operations are most sensitive to fluctuations in copper price and grade. It is less sensitive to changes in operating costs and capital costs. The operations are least sensitive to variations in molybdenum price and grade.

22.17 Risks and Opportunities

Factors that may affect the mineral resource and mineral reserve estimates were identified in Chapter 11.12.2 and Chapter 12.4 respectively.

22.17.1 Risks

Risks to the Toquepala Operations include:

- The mineral reserve estimates are sensitive to metal prices. Lower metal prices than forecast in the LOM plan may require revisions to the mine plan, with impacts to the mineral reserve estimates and the economic analysis that supports the mineral reserve estimates.
- Geotechnical and hydrological assumptions used in mine planning are based on historical performance, and to date historical performance has been a reasonable predictor of current conditions. Any changes to the geotechnical, including seismicity, and hydrological assumptions could affect mine planning, affect capital cost estimates if any major rehabilitation is required due to a geotechnical (seismic) or hydrological event, affect operating costs due to mitigation measures that may need to be imposed, and impact the economic analysis that supports the mineral reserve estimates.
- The Quebrada Honda TSF does not have sufficient storage capacity for the LOM. The mine plan assumes that a new facility location can be obtained, designs completed and approved by the relevant regulatory authorities, and the new facility can be constructed and commissioned prior to 2036. If the TSF is not available by the time envisaged, this could affect the mineral reserves, capital and operating cost estimates, and the economic analysis.
- Wood has assumed that the new TSF will be a dry-stack facility and has estimated capital and operating costs for such a facility. If the final TSF option uses a different disposal

method, this could affect the mineral reserves, capital and operating cost estimates, and the economic analysis.

- The new Global Industry Standard on Tailings Management (GISTM) provides a set of industry standards to guide design and management of TSFs. Members and non-members of International Council on Mining and Metals (ICMM) are required to be in compliance with the GISTM over the next several years. The TSF design needs to be revisited and be revised as needed to be in full compliance with the recently-published global tailings standard (GISTM, 2020). This may result in changes to the design criteria. Such changes may result in increases to the capital cost estimates, and changes to the operating cost estimates, which could affect the mineral reserve estimates.
- Labor cost increases or productivity decreases, particularly due to the impact of Covid-19, could also impact the estimated mineral reserves, operating cost estimates and the economic analysis.
- Commodity price increases for key consumables such diesel, electricity, tires, and chemicals would negatively impact the stated mineral reserves because of the effect on the forecast operating costs.
- Assumed permitting and project development timelines may be longer than anticipated for the new TSF.
- Political risk from legislation changes potentially affecting mining licenses and/or Southern Copper's right to operate.

22.17.2 Opportunities

Opportunities include:

- Conversion of some or all of the indicated mineral resources currently reported exclusive of mineral reserves to mineral reserves, with appropriate supporting studies.
- Upgrade of some or all of the inferred mineral resources to higher-confidence categories, such that it could be included in the mine plan and converted to mineral reserves, reduce mining costs by reducing the waste stripping, and extend the mine life.
- Considering an elevated cut-off strategy over a longer period of the mine life and revision of the life of mine plan could result in a better economic outcome.
- Higher metal prices than forecast could result in higher sales revenues and potentially an increase in predicted Project economics.

22.18 Conclusions

Under the assumptions presented in this Report, the Toquepala Operations have a positive net present value from the forecast cashflows and support the mineral reserve estimates.

23.0 RECOMMENDATIONS

23.1 Introduction

The recommended work programs total US$1.5–US$2.2 million.

23.2 Internal Controls

In numerous cases when preparing this Report, Wood QPs requested copies of internal protocols, management plans, and registers, which were not forthcoming. Wood recommends that Southern Copper establish a document database where these types of documentation are stored and maintained for currency, so that they are readily available if requested by Southern Copper staff or external reviewers and auditors.

This work is estimated at US$0.1–US$0.2 million.

23.3 Database

A high rate of unavailable drill hole documentation was noted, and systematic storage of supporting documentation is not part of the current procedures. Wood recommends that a document storage system be implemented, and all supporting documentation be properly stored.

A verification program to confirm recovery, logging, and density data should be completed. Only data that have been verified should be included in the Project database.

This work is estimated at US$0.2–US$0.3 million.

23.4 Mineral Resources

No capping or outlier restriction was used during mineral resource estimation; however, Wood found some evidence of over-projection of high grades. Wood recommends that a capping study is completed and outlier restriction is used to control grade estimation.

This work is estimated at US$0.05–US$0.1 million.

23.5 Mine Plan

The mine plan should be reviewed to assess opportunities to optimize the mine sequencing such that short-term periods in the current plan where economics are marginal or negative can be mitigated or removed. Consider use of an elevated cut-off strategy over a longer period of the mine life and revise the life of mine plan to provide optimal economic outcomes over maximizing ore tonnage.

This work is estimated at US$0.2–US$0.3 million.

23.6 Tailings Storage Facility

The new Global Industry Standard on Tailings Management (GISTM) provides a set of industry standards to guide design and management of TSFs. Members and non-members of International Council on Mining and Metals (ICMM) are required to be in compliance with the GISTM over the next several years. The TSF design should be revisited and revised where needed to ensure full compliance with the recently-published global tailings standard (GISTM, 2020).

This work of engineering evaluation is estimated at US$0.1–US$0.2 million.

23.7 Tailings and Waste Management

The Quebrada Honda TSF design capacity is estimated to be reached in 2036. For the purposes of this Report, Wood assumed that tailings from the Toquepala Operations would be filtered and stored (dry stack) in a facility to be constructed near the Quebrada Honda TSF area.

Southern Copper should review the most appropriate storage options for the tailings materials for the LOM after 2036, based on LOM storage requirements and site conditions. Initial conceptual designs based on existing geotechnical investigation and tailings characterization data are sufficient to support assessment of potential permitting and surface rights requirements at this stage.

The engineering design work required to advance to a prefeasibility level study is estimated at US$0.8–US$1 million.

23.8 Permitting

Southern Copper should:

- identify the surface rights required to support the preferred tailings management facility and the path needed to secure these rights and obtain the necessary agreements with current surface rights holders.
- determine the permitting path, types of permits and quantity of permits and authorizations required to construct and operate the selected facility.
- confirm if any additional baseline studies will be required in support of permit applications for the preferred tailings facility.

The permitting determination work is estimated at US$0.05–US$0.1 million.

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24.2 Abbreviations and Symbols

Abbreviation/Symbol	Term
3D	three-dimensional
AA	atomic absorption
AAS	atomic absorption spectrometry
EIA	Environmental Impact Assessment
EW	electrowinning
G&A	general and administrative
GPS	global positioning system
HPGR	high pressure grinding rolls
ICP	inductively coupled plasma
ICP-MS	inductively coupled plasma–mass spectrometry
ICP-OES	inductively coupled plasma-optical emission spectroscopy
LESDE	leach–solvent extraction (SX)–electrowin (EW) in the Spanish acronym
LOM	life-of-mine
Mlb	million pounds
Mt	million tonnes
MWh	megawatts
NN	Nearest neighbor
NSR	net smelter return
OK	ordinary kriging
PEN$	Peruvian nuevo sol
QA/QC	quality assurance and quality control
QP	Qualified Person
RC	reverse circulation
RQD	rock quality designation
ROM	run-of-mine
st	short tons
SX	solvent extraction
t	metric tonne
TSF	tailings storage facility
US	United States
US$	United States dollars
WRSF	waste rock storage facility

24.3 Glossary of Terms

Term	Definition
aquifer	A geologic formation capable of transmitting significant quantities of groundwater under normal hydraulic gradients.
argillic alteration	Introduces any one of a wide variety of clay minerals, including kaolinite, smectite and illite. Argillic alteration is generally a low temperature event, and some may occur in atmospheric conditions.
Atterberg limit	A measure of the critical water contents of a fine-grained material.
azimuth	The direction of one object from another, usually expressed as an angle in degrees relative to true north. Azimuths are usually measured in the clockwise direction, thus an azimuth of 90 degrees indicates that the second object is due east of the first.
ball mill	A piece of milling equipment used to grind ore into small particles. It is a cylindrical shaped steel container filled with steel balls into which crushed ore is fed. The ball mill is rotated causing the balls themselves to cascade, which in turn grinds the ore.
beneficiation	Physical treatment of crude ore to improve its quality for some specific purpose. Also called mineral processing.
Bond ball mill work index/Bond work index (BWi)	A measure of the energy required to break an ore to a nominal product size, determined in laboratory testing, and used to calculate the required power in a grinding circuit design.
Brazilian tensile test	Indirectly determines the tensile strength of a rock
bullion	Unrefined gold and/or silver mixtures that have been melted and cast into a bar or ingot.
comminution/crushing/grinding	Crushing and/or grinding of ore by impact and abrasion. Usually, the word "crushing" is used for dry methods and "grinding" for wet methods. Also, "crushing" usually denotes reducing the size of coarse rock while "grinding" usually refers to the reduction of the fine sizes.
concentrate	The concentrate is the valuable product from mineral processing, as opposed to the tailing, which contains the waste minerals. The concentrate represents a smaller volume than the original ore.

Term	Definition
counter-current decantation (CCD)	A process where a slurry is thickened and washed in multiple stages, where clean water is added to the last thickener, and overflows from each thickener are progressively transferred to the previous thickener, countercurrent to the flow of thickened slurry.
cut-off grade	A grade level between two alternative courses of action. Material above the cut-off is dealt with in one way, while material with a grade below the cut-off is dealt with in another way. For example: the cut-off grade between material being directed to the mill or to the leach dump; or the grade level between material being directed to the stockpile or the waste dump.
data verification	The process of confirming that data has been generated with proper procedures, has been accurately transcribed from the original source and is suitable to be used for mineral resource and mineral reserve estimation.
density	The mass per unit volume of a substance, commonly expressed in grams/ cubic centimeter.
development	Often refers to the construction of a new mine or; is the underground work carried out for the purpose of reaching and opening up a mineral deposit. It includes shaft sinking, cross-cutting, drifting and raising.
dilution	Waste or low-grade rock which is unavoidably removed along with the ore in the mining process.
direct shear strength	Method used to determine the shear strength of a material. Shear strength is defined as the maximum resistance that a material can withstand when subjected to shearing.
easement	Areas of land owned by the property owner, but in which other parties, such as utility companies, may have limited rights granted for a specific purpose.
electrowinning.	The removal of precious metals from solution by the passage of current through an electrowinning cell. A direct current supply is connected to the anode and cathode. As current passes through the cell, metal is deposited on the cathode. When sufficient metal has been deposited on the cathode, it is removed from the cell and the sludge rinsed off the plate and dried for further treatment.

Term	Definition
encumbrance	An interest or partial right in real property which diminished the value of ownership, but does not prevent the transfer of ownership. Mortgages, taxes and judgements are encumbrances known as liens. Restrictions, easements, and reservations are also encumbrances, although not liens.
feasibility study	• A feasibility study is a comprehensive technical and economic study of the selected development option for a mineral project, which includes detailed assessments of all applicable modifying factors, as defined by this section, together with any other relevant operational factors, and detailed financial analysis that are necessary to demonstrate, at the time of reporting, that extraction is economically viable. The results of the study may serve as the basis for a final decision by a proponent or financial institution to proceed with, or finance, the development of the project. • A feasibility study is more comprehensive, and with a higher degree of accuracy, than a pre-feasibility study. It must contain mining, infrastructure, and process designs completed with sufficient rigor to serve as the basis for an investment decision or to support project financing.
flotation	Separation of minerals based on the interfacial chemistry of the mineral particles in solution. Reagents are added to the ore slurry to render the surface of selected minerals hydrophobic. Air bubbles are introduced to which the hydrophobic minerals attach. The selected minerals are levitated to the top of the flotation machine by their attachment to the bubbles and into a froth product, called the "flotation concentrate." If this froth carries more than one mineral as a designated main constituent, it is called a "bulk float". If it is selective to one constituent of the ore, where more than one will be floated, it is a "differential" float.
flowsheet	The sequence of operations, step by step, by which ore is treated in a milling, concentration, or smelting process.
frother	A type of flotation reagent which, when dissolved in water, imparts to it the ability to form a stable froth.
gangue	The fraction of ore rejected as tailing in a separating process. It is usually the valueless portion, but may have some secondary commercial use

Term	Definition
heap leaching	A process whereby valuable metals, usually gold and silver, are leached from a heap or pad of crushed ore by leaching solutions percolating down through the heap and collected from a sloping, impermeable liner below the pad.
high pressure grinding rolls (HPGR)	A type of crushing machine consisting of two large studded rolls that rotate inwards and apply a high pressure compressive force to break rocks.
indicated mineral resource	An indicated mineral resource is that part of a mineral resource for which quantity and grade or quality are estimated on the basis of adequate geological evidence and sampling. The term adequate geological evidence means evidence that is sufficient to establish geological and grade or quality continuity with reasonable certainty. The level of geological certainty associated with an indicated mineral resource is sufficient to allow a qualified person to apply modifying factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit.
inferred mineral resource	• An inferred mineral resource is that part of a mineral resource for which quantity and grade or quality are estimated on the basis of limited geological evidence and sampling. The term limited geological evidence means evidence that is only sufficient to establish that geological and grade or quality continuity is more likely than not. The level of geological uncertainty associated with an inferred mineral resource is too high to apply relevant technical and economic factors likely to influence the prospects of economic extraction in a manner useful for evaluation of economic viability. • A qualified person must have a reasonable expectation that the majority of inferred mineral resources could be upgraded to indicated or measured mineral resources with continued exploration; and should be able to defend the basis of this expectation before his or her peers.
internal rate of return (IRR)	The rate of return at which the net present value of a project is zero; the rate at which the present value of cash inflows is equal to the present value of the cash outflows.

Term	Definition
initial assessment	An initial assessment is a preliminary technical and economic study of the economic potential of all or parts of mineralization to support the disclosure of mineral resources. The initial assessment must be prepared by a qualified person and must include appropriate assessments of reasonably assumed technical and economic factors, together with any other relevant operational factors, that are necessary to demonstrate at the time of reporting that there are reasonable prospects for economic extraction. An initial assessment is required for disclosure of mineral resources but cannot be used as the basis for disclosure of mineral reserves
Lerchs–Grossmann	An algorithm used to design the contour of an open pit so as to maximize the difference between the total mine value of ore extracted and the total extraction cost of ore and waste.
life of mine (LOM)	Number of years that the operation is planning to mine and treat ore, and is taken from the current mine plan based on the current evaluation of ore reserves.
measured mineral resource	A measured mineral resource is that part of a mineral resource for which quantity and grade or quality are estimated on the basis of conclusive geological evidence and sampling. The term conclusive geological evidence means evidence that is sufficient to test and confirm geological and grade or quality continuity. The level of geological certainty associated with a measured mineral resource is sufficient to allow a qualified person to apply modifying factors, as defined in this section, in sufficient detail to support detailed mine planning and final evaluation of the economic viability of the deposit.
mill	Includes any ore mill, sampling works, concentration, and any crushing, grinding, or screening plant used at, and in connection with, an excavation or mine.

Term	Definition
mineral reserve	• A mineral reserve is an estimate of tonnage and grade or quality of indicated and measured mineral resources that, in the opinion of the qualified person, can be the basis of an economically viable project. More specifically, it is the economically mineable part of a measured or indicated mineral resource, which includes diluting materials and allowances for losses that may occur when the material is mined or extracted. • The determination that part of a measured or indicated mineral resource is economically mineable must be based on a preliminary feasibility (pre-feasibility) or feasibility study, as defined by this section, conducted by a qualified person applying the modifying factors to indicated or measured mineral resources. Such study must demonstrate that, at the time of reporting, extraction of the mineral reserve is economically viable under reasonable investment and market assumptions. The study must establish a life of mine plan that is technically achievable and economically viable, which will be the basis of determining the mineral reserve. • The term economically viable means that the qualified person has determined, using a discounted cash flow analysis, or has otherwise analytically determined, that extraction of the mineral reserve is economically viable under reasonable investment and market assumptions. • The term investment and market assumptions include all assumptions made about the prices, exchange rates, interest and discount rates, sales volumes, and costs that are necessary to determine the economic viability of the mineral reserves. The qualified person must use a price for each commodity that provides a reasonable basis for establishing that the project is economically viable.

Term	Definition
mineral resource	• A mineral resource is a concentration or occurrence of material of economic interest in or on the Earth's crust in such form, grade or quality, and quantity that there are reasonable prospects for economic extraction. • The term material of economic interest includes mineralization, including dumps and tailings, mineral brines, and other resources extracted on or within the earth's crust. It does not include oil and gas resources, gases (e.g., helium and carbon dioxide), geothermal fields, and water. • When determining the existence of a mineral resource, a qualified person, as defined by this section, must be able to estimate or interpret the location, quantity, grade or quality continuity, and other geological characteristics of the mineral resource from specific geological evidence and knowledge, including sampling; and conclude that there are reasonable prospects for economic extraction of the mineral resource based on an initial assessment, as defined in this section, that he or she conducts by qualitatively applying relevant technical and economic factors likely to influence the prospect of economic extraction.
net smelter return (NSR)	A defined percentage of the gross revenue from a resource extraction operation, less a proportionate share of transportation, insurance, and processing costs.
open pit	A mine that is entirely on the surface. Also referred to as open-cut or open-cast mine.
phyllic alteration	Minerals include quartz-sericite-pyrite
plant	A group of buildings, and especially to their contained equipment, in which a process or function is carried out; on a mine it will include warehouses, hoisting equipment, compressors, repair shops, offices, mill or concentrator.
potassic alteration	A relatively high temperature type of alteration which results from potassium enrichment. Characterized by biotite, K-feldspar, adularia.
preliminary feasibility study, pre-feasibility study	• A preliminary feasibility study (prefeasibility study) is a comprehensive study of a range of options for the technical and economic viability of a mineral project that has advanced to a stage where a qualified person has determined (in the case of underground mining) a preferred mining method, or (in the case of surface mining) a pit configuration, and in all cases has determined an effective method of mineral processing and an effective plan to sell the product.

Term	Definition
	• A pre-feasibility study includes a financial analysis based on reasonable assumptions, based on appropriate testing, about the modifying factors and the evaluation of any other relevant factors that are sufficient for a qualified person to determine if all or part of the indicated and measured mineral resources may be converted to mineral reserves at the time of reporting. The financial analysis must have the level of detail necessary to demonstrate, at the time of reporting, that extraction is economically viable
probable mineral reserve	A probable mineral reserve is the economically mineable part of an indicated and, in some cases, a measured mineral resource. For a probable mineral reserve, the qualified person's confidence in the results obtained from the application of the modifying factors and in the estimates of tonnage and grade or quality is lower than what is sufficient for a classification as a proven mineral reserve, but is still sufficient to demonstrate that, at the time of reporting, extraction of the mineral reserve is economically viable under reasonable investment and market assumptions. The lower level of confidence is due to higher geologic uncertainty when the qualified person converts an indicated mineral resource to a probable reserve or higher risk in the results of the application of modifying factors at the time when the qualified person converts a measured mineral resource to a probable mineral reserve. A qualified person must classify a measured mineral resource as a probable mineral reserve when his or her confidence in the results obtained from the application of the modifying factors to the measured mineral resource is lower than what is sufficient for a proven mineral reserve.
propylitic	Characteristic greenish colour. Minerals include chlorite, actinolite and epidote. Typically contains the assemblage quartz-chlorite-carbonate
proven mineral reserve	A proven mineral reserve is the economically mineable part of a measured mineral resource. For a proven mineral reserve, the qualified person has a high degree of confidence in the results obtained from the application of the modifying factors and in the estimates of tonnage and grade or quality. A proven mineral reserve can only result from conversion of a measured mineral resource.

Term	Definition
qualified person	A qualified person is an individual who is a mineral industry professional with at least five years of relevant experience in the type of mineralization and type of deposit under consideration and in the specific type of activity that person is undertaking on behalf of the registrant; and an eligible member or licensee in good standing of a recognized professional organization at the time the technical report is prepared. For an organization to be a recognized professional organization, it must: • Be either: – An organization recognized within the mining industry as a reputable professional association, or – A board authorized by U.S. federal, state or foreign statute to regulate professionals in the mining, geoscience or related field • Admit eligible members primarily on the basis of their academic qualifications and experience • Establish and require compliance with professional standards of competence and ethics • Require or encourage continuing professional development • Have and apply disciplinary powers, including the power to suspend or expel a member regardless of where the member practices or resides; and • Provide a public list of members in good standing.
quebrada	Gorge or ravine
reclamation	The restoration of a site after mining or exploration activity is completed.
refining	A high temperature process in which impure metal is reacted with flux to reduce the impurities. The metal is collected in a molten layer and the impurities in a slag layer. Refining results in the production of a marketable material.
refractory	Gold mineralization normally requiring more sophisticated processing technology for extraction, such as roasting or autoclaving under pressure.
rock quality designation (RQD)	A measure of the competency of a rock, determined by the number of fractures in a given length of drill core. For example, a friable ore will have many fractures and a low RQD.
rod mill	A rotating cylindrical mill which employs steel rods as a grinding medium.

Term	Definition
royalty	An amount of money paid at regular intervals by the lessee or operator of an exploration or mining property to the owner of the ground. Generally based on a specific amount per tonne or a percentage of the total production or profits. Also, the fee paid for the right to use a patented process.
run-of-mine	Rehandle where the raw mine ore material is fed into the processing plant's system, usually the crusher. This is where material that is not direct feed from the mine is stockpiled for later feeding. Run-of-mine relates to the rehandle being for any mine material, regardless of source, before entry into the processing plant's system.
solvent extraction-electrowinning (SX/EW)	A metallurgical technique primarily applied to copper ores, in which metal is dissolved from the rock by organic solvents and recovered from solution by electrolysis.
specific gravity	The weight of a substance compared with the weight of an equal volume of pure water at 4°C.
supergene	Mineral enrichment produced by the chemical remobilisation of metals in an oxidised or transitional environment.
tailings	Material rejected from a mill after the recoverable valuable minerals have been extracted.
triaxial compressive strength	A test for the compressive strength in all directions of a rock or soil sample.
uniaxial compressive strength	A measure of the strength of a rock, which can be determined through laboratory testing, and used both for predicting ground stability underground, and the relative difficulty of crushing.

25.0 RELIANCE ON INFORMATION PROVIDED BY THE REGISTRANT

25.1 Introduction

Wood QPs fully relied on the registrant for information in the categories noted in the following subsections.

The Wood QPs consider it is reasonable to rely on Southern Copper because the company has considerable experience in developing and operating mines in Peru similar to the Toquepala Operations, and elsewhere in the Americas.

25.2 Macroeconomic Trends

- Information relating to discount rates, foreign exchange rates, taxes.

This information is used in the economic analysis in Chapter 19. It supports the mineral resource estimate in Chapter 11, and the mineral reserve estimate in Chapter 12.

25.3 Marketing Information

- Information relating to market studies/markets for product, marketing and sales contracts, product valuation and metal prices, product specifications, refining and treatment charges, transportation costs, agency relationships, material contracts (e.g., mining, concentrating, smelting, refining, transportation, handling, and forward sales contracts), and contract status (in place, renewals).

This information is used when discussing the market, metal prices and contract information in Chapter 16, and in the economic analysis in Chapter 19. It supports the mineral resource estimate in Chapter 11, and the mineral reserve estimate in Chapter 12.

25.4 Legal Matters

- Information relating to the corporate ownership interest, the mineral tenure (concessions, payments to retain, obligation to meet expenditure/reporting of work conducted), surface rights, water rights (water take allowances), royalties, encumbrances, easements and rights-of-way, violations and fines, permitting requirements, ability to maintain and renew permits, monitoring requirements and monitoring frequency, and bonding requirements.

This information is used in support of the property ownership information in Chapter 3, the permitting and closure discussions in Chapter 17, and the economic analysis in Chapter 19. It supports the mineral resource estimate in Chapter 11, and the mineral reserve estimate in Chapter 12.

25.5 Environmental Matters

- Information relating to baseline and supporting studies for environmental permitting, environmental permitting and monitoring requirements, ability to maintain and renew permits, emissions controls, closure planning, closure and reclamation bonding and bonding requirements, sustainability accommodations, and monitoring for and compliance with requirements relating to protected areas and protected species.

This information is used when discussing property ownership information in Chapter 3, the permitting and closure discussions in Chapter 17, and the economic analysis in Chapter 19. It supports the mineral resource estimate in Chapter 11, and the mineral reserve estimate in Chapter 12.

25.6 Stakeholder Accommodations

- Information relating to social and stakeholder baseline and supporting studies, hiring and training policies for workforce from local communities, partnerships with stakeholders (including national, regional, and state mining associations; trade organizations; fishing organizations; state and local chambers of commerce; economic development organizations; non-government organizations; and state and federal governments), and the community relations plan.

This information is used in the social and community discussions in Chapter 17, and the economic analysis in Chapter 19. It supports the mineral resource estimate in Chapter 11, and the mineral reserve estimate in Chapter 12.

25.7 Governmental Factors

- Information relating to taxation and government royalty considerations at the Project level.

This information is used in the economic analysis in Chapter 19. It supports the mineral resource estimate in Chapter 11, and the mineral reserve estimate in Chapter 12.